1 JANUARY 1954

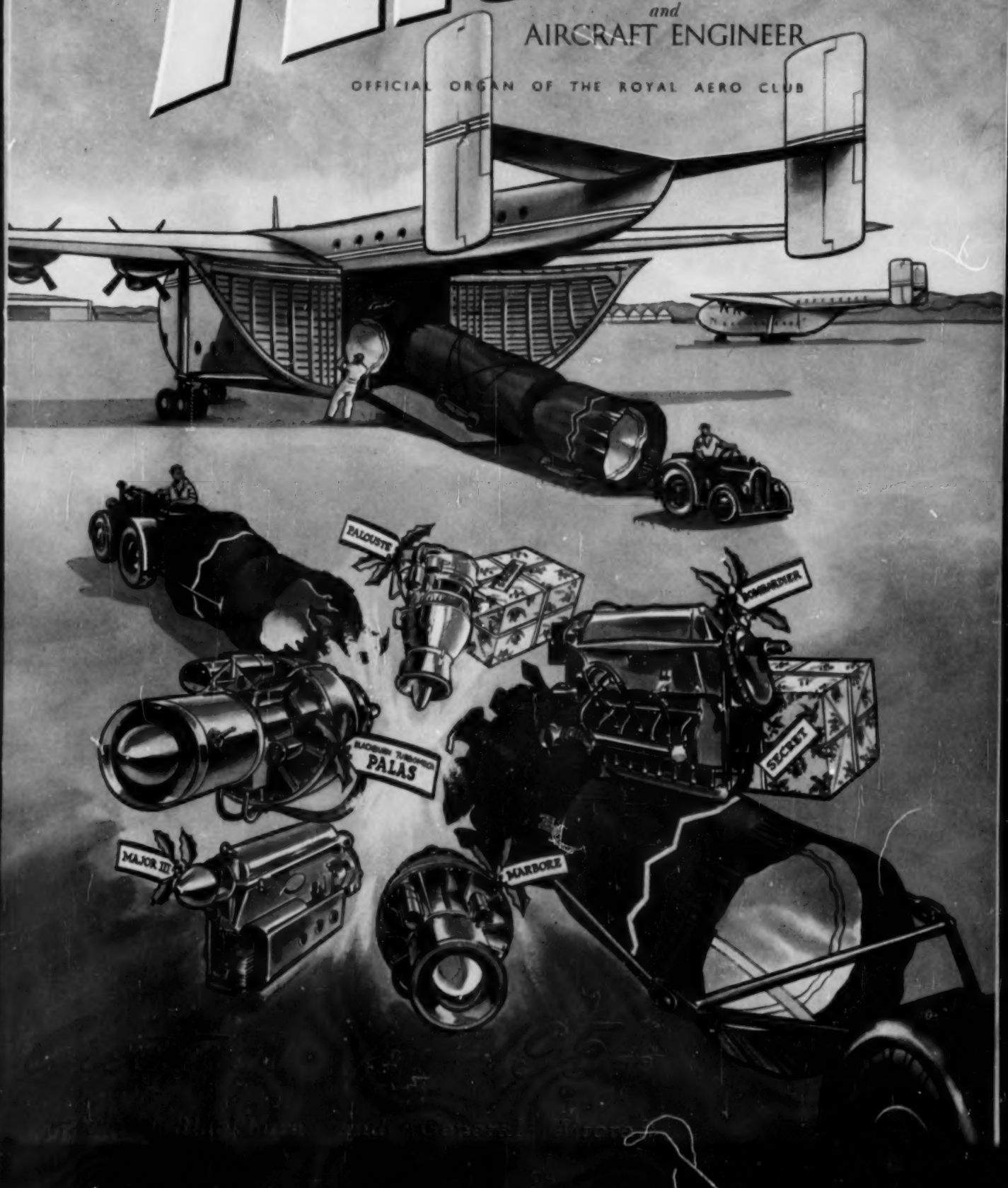
ONE SHILLING

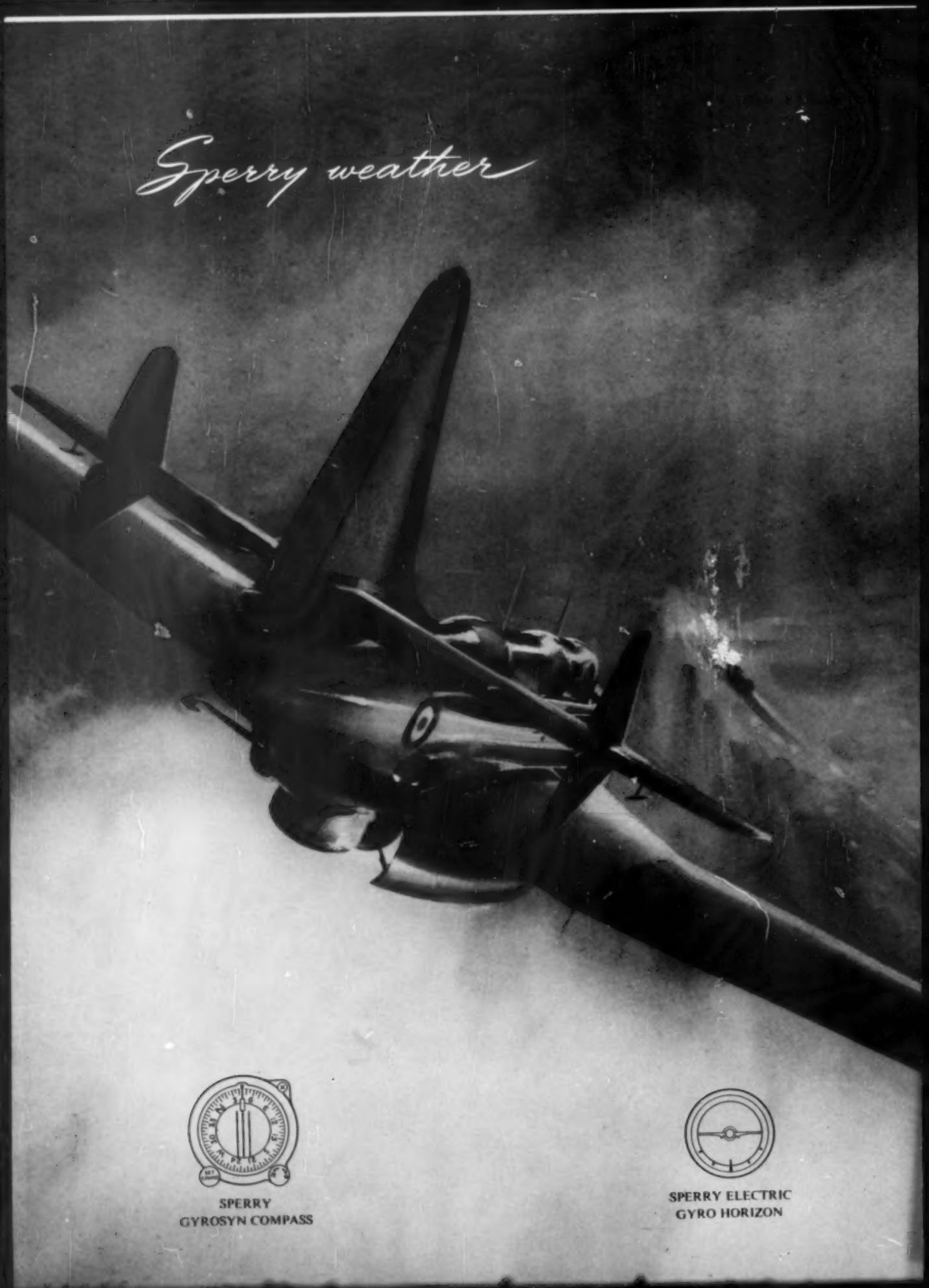
FLIGHT

and

AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB




Sperry weather
SPERRY
GYROSYN COMPASS
SPERRY ELECTRIC
GYRO HORIZON

TITANINE

AIRCRAFT FINISHES
ARE USED ON THE
HANDLEY-PAGE VICTOR

THE WORLD'S FIRST CRESCENT-WING BOMBER

Latest addition to the offensive armoury of the R.A.F., the Victor is a formidable aircraft by any standards and Titanine are proud to be associated with the designers and builders of this famous machine. As still higher speeds are attained, the role of aircraft finishes becomes increasingly important. Thus the programme of experiment carried out by the Titanine research team plays a full part in the rapid development of our aircraft industry.

TITANINE FINISHES

T I T A N I N E L I M I T E D

COLINDALE · LONDON · N.W.9 TELEPHONE: COLINDALE 8123 (6 lines)

Factories: London • Surrey • Scotland · *Associated Companies:* U.S.A. & Holland

H-R

KEY TO QUICKER PRODUCTION!

GLASS LAMINATES

Resin bonded glass fabric. Immensely strong. Impervious to normal temperature and humidity variations. Moulded **double curvature** drill, trim and assembly jigs a speciality.

Combined with

HY-DU-LIGNUM

We are specialists in the design and production of rubber press dies, drill and router templates, Hufford stretch press tools, etc. Increased board production makes HY-DU-LIGNUM immediately available for use in your own tool room. Board sizes now increased to 84″ × 48″.

Glass laminate drill and trim shroud with Hy-du-lignum base.

Photograph by courtesy of Motor Panels (Coventry) Ltd.

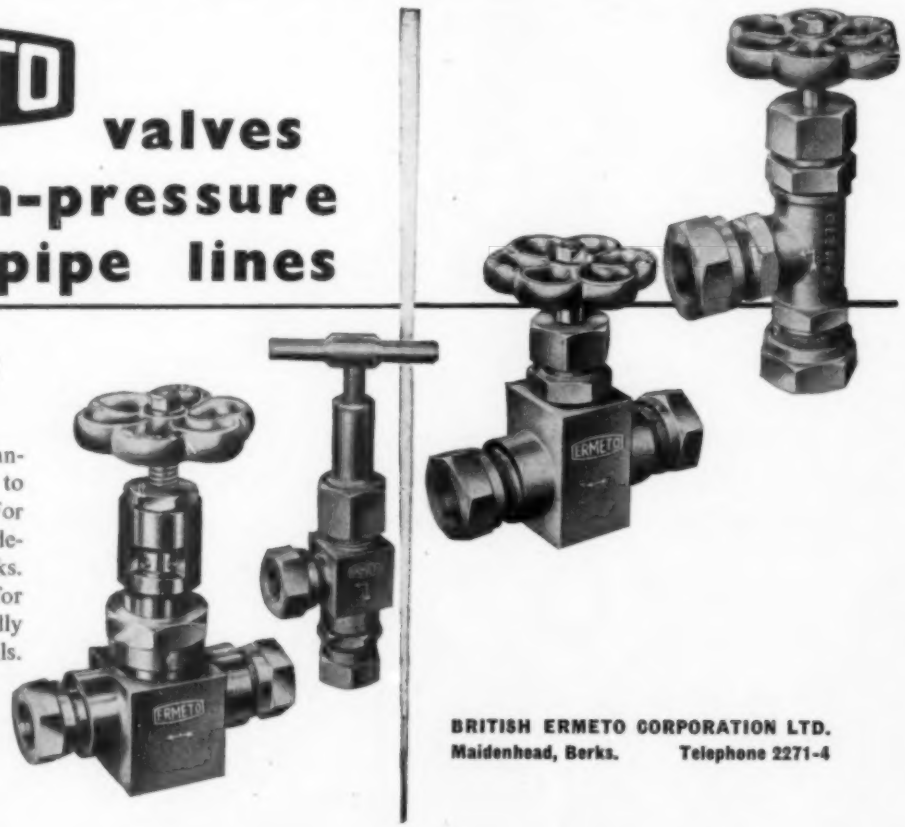
HORDERN-RICHMOND LTD. laminated-compressed Hy-du-lignum "the made-to-measure wood" HADDENHAM BUCKS ENGLAND

HORDERN-RICHMOND (SALES) LIMITED
Head Office: Hy-du-lignum Works, Haddenham, Bucks, England
Northern Office: Barton Arcade. Deansgate, Manchester

Telephone: AYLESBURY 1100-1102 *Telegrams: WINSTIX, AYLESBURY*

ERMETO
Regd Trade Mark

valves for high-pressure pipe lines



Expressly designed for the job!

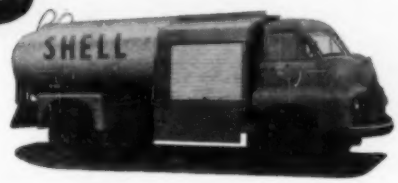
Normally our stocks of standard valves are sufficient to meet urgent requirements. For large quantities, however, delivery is from 8 - 12 weeks. Non-standard valves for special requirements gladly quoted for on receipt of details.

Technical literature available on request

BRITISH ERMETO CORPORATION LTD.
Maidenhead, Berks. Telephone 2271-4

DORSET

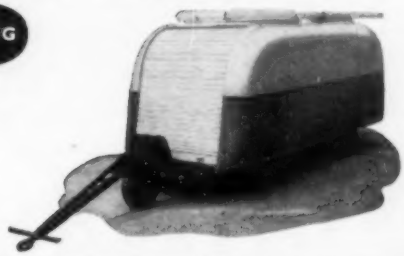
LINCOLN



PRESSURE FUELLER

TRENT

KALLANG



HANEDA

TB
BILSTON

AIRCRAFT REFUELLING EQUIPMENT

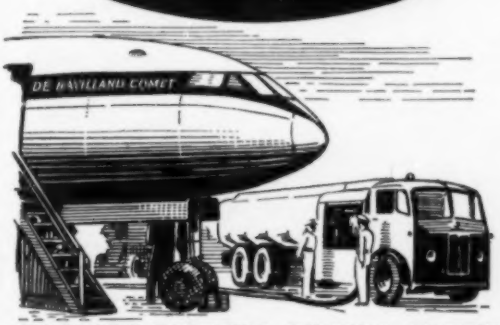
is now in use in practically all parts of the World

The design and manufacture of fuelling equipment for Aircraft of all types is now a highly specialised and important division of the "TB" organisation.

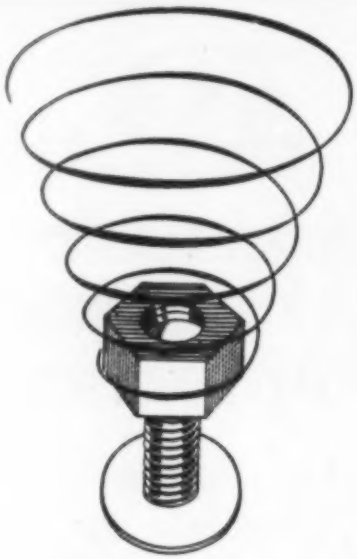
Today we offer a service based on long experience of aircraft requirements, backed by strong tradition of "pride in the job". It is a service known and depended upon by airlines all over the globe.

★ ALL OUR FUELLERS ARE EQUIPPED FOR OVERWING OR PRESSURE FUELLING

THOMPSON BROTHERS



THOMPSON BROTHERS (BILSTON) LIMITED.
BRADLEY ENGINEERING WORKS · BILSTON · STAFFS.
Telephone: Bilston 41264/8 Telegrams: Thompbros, Bilston
London Office: Aldwych House, Aldwych, W.C.2. Tel.: Holborn 1416.



Eleven standard models cover all loads up to 450 lbs./ft. Larger models to special order.

Say when!

You decide the required torque load and you can depend upon the pre-determined load being applied accurately to every bolt even with unskilled labour when ACRATORK spanners are used. Think what it can save you to eliminate breakages in assembly, damaged parts and failures in service due to inaccurately and unevenly loaded bolts !

Let us send you full particulars of :—

ACRATORK

PRECISION TORQUE SPANNERS

Sole Sales Agents:-

CORY BROTHERS & COMPANY LIMITED

CORYS' BUILDINGS, CARDIFF. *Telephone:* 31141

BRITISH EMULSIFIERS LIMITED

AND

ASSOCIATED COMPANIES

Specialists in Sheet Metal Fabrication Design and Prototype Production for the Aircraft, Motor and Marine Industries

DIRECT SUPPLIERS TO M.o.S. & ADMIRALTY

A.I.D. & A.R.B. APPROVED

Drop Tanks
Internal Fuel Tanks
Hydraulic Header Tanks
Filter Assemblies
Beams and Fairings
Bomb Release Units
Wing and Tail Sections
General Aircraft Repair Work
Oil Dispensing Cabinets
Gas-Heating Cabinets
Cooling Cabinets
Radiator Cores

All enquiries to:

16/24 Brewery Road, London, N.7

Telephone : NORTH 4411/7

SPECIFICATION

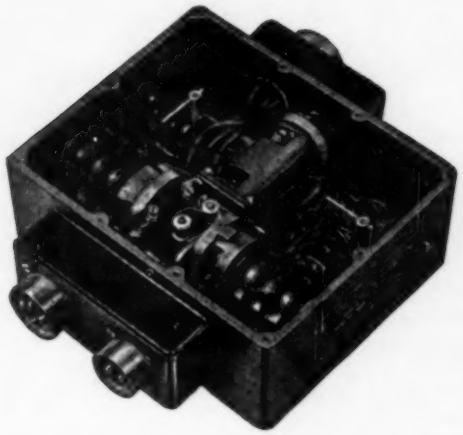
plus

GEARS

FOR HIGHEST MECHANICAL DUTIES TO YOUR LIMITS—DESIGN AND TIME

S. E. OPPERMAN LTD.

Stirling Corner (A.1. Route), Boreham Wood, Herts., England. Phone: Elstree 2021



CYCLIC DE-ICING SWITCH

by

Teddington

This switch is designed to operate a 3 phase 400 cycles supply and is capable of carrying a load of 22 amps. on 208 volts.

It directs the supply in a controlled time sequence to de-icing installations on the propeller spinners and air intakes of turbo-propeller engines.

The switching unit employs a bank of cams driven by a two-speed governed motor through an 18,000 : 1 reduction gear box. The motor operates on 24 volts D.C. nominal.

SPECIFICATION

Switching Sequence.
High speed : full cycle 120 secs.
Propeller and Spinner on 30 secs.
off 90 secs.
Air Intakes on 20 secs.
off 40 secs.
5 secs. interswitching delay.
Slow speeds:
Triple above times.

Loading: Will carry 22 amps (non-inductive) on 208 volts, 3 phase 400 cps.
Motor: 24 volts D.C. nominal.
Temperature: — 50° C. to + 80° C.
Vibration: To B.S.S. G/103.
Acceleration: To B.S.S. G/100.
Connections:
Fire and Waterproof Plessey Breeze Plugs.
6 pin.
4 pin.
3 pin.

Teddington AUTOMATIC CONTROLS

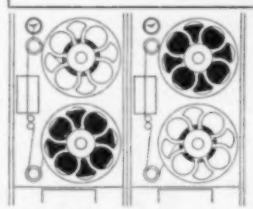
TEDDINGTON CONTROLS LTD., CEFN COED, MERTHYR TYDFIL, SOUTH WALES. *(Merthyr Tydfil 666).*

AUTOMATIC CHANGE-OVER

To ensure recorded continuous "listening-watch" an automatic change-over is provided in the THERMIONIC MULTI-CHANNEL AIRPORT RECORDER. Without supervision the Recorder automatically switches over from one tape transport to the next, allowing an overlap of several minutes, to ensure absolute continuity of recording. In addition the certainty of operation of all sections of the Recorder is guarded by the Master Control Unit; thus should for example a fuse blow in one of the power units, the next available power unit is automatically switched into operation. A system of warning lights and bell signals is also provided ensuring a further constant check upon the correct functioning of every part of the installation. Other outstanding features are :—

- *magnetic recording tape can be re-used indefinitely.*
- ***separate** de-magnetising unit prevents erasure of recordings by unauthorised personnel.*
- *basic 4-channel equipment readily expanded to maximum of 14-channels.*
- *built to withstand all climatic extremes.*

The
THERMIONIC MULTI-CHANNEL AIRPORT RECORDER

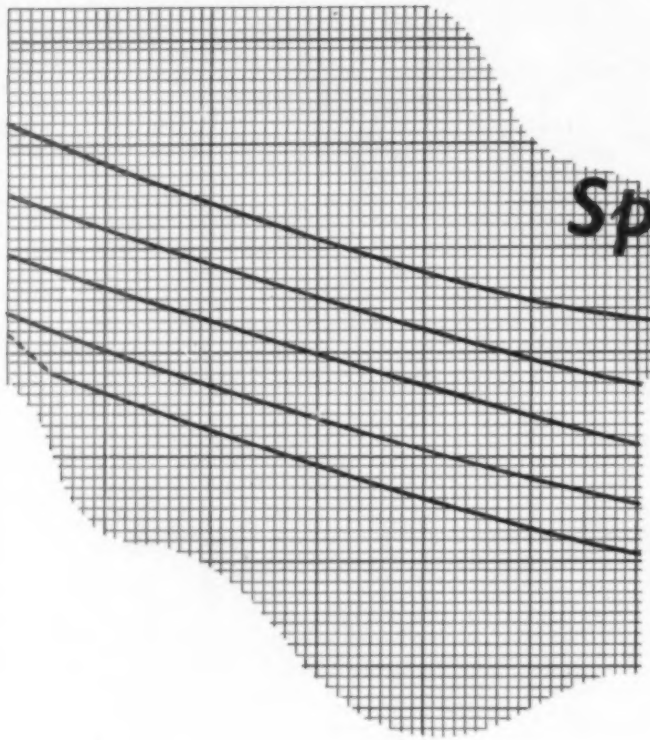


Further details and specifications on application to :

THERMIONIC PRODUCTS LIMITED
leaders in the field of magnetic recording

AND

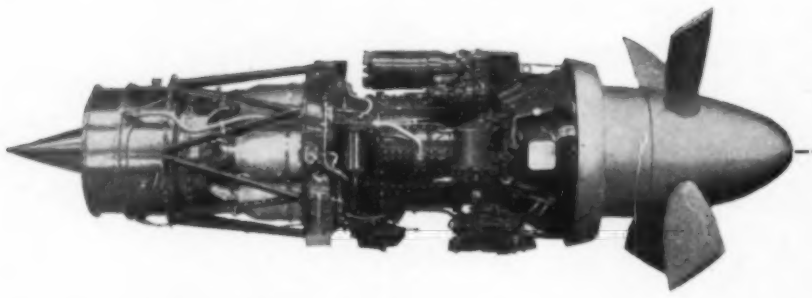
BRUSH CRYSTAL COMPANY LIMITED
HYTHE • SOUTHAMPTON • ENGLAND
Telephone: Hythe (Southampton) 3265/9 *Cables:* Technico, Hythe, Southampton



Specifically—

—at a specific weight of 0·52 lb./e.h.p. and recording a specific consumption at 30,000 ft. and 400 m.p.h. of 0·48 lb./e.h.p./hr. the Eland presents a prospect of marked operating economy. The reduction of installed weight alone represents a substantial increase in revenue potential of particular value in medium-range inter-city operation.

ELAND



ELAND ENGINES HAVE BEEN SELECTED FOR THE FAIREY ROTODYNE

designed and developed by

NAPIER

D. NAPIER AND SON LIMITED · LONDON · W.3

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World

Founded 1909

No. 2345 Vol. 65. FRIDAY, 1 JANUARY 1954

EDITOR
MAURICE A. SMITH, D.F.C.

ASSISTANT EDITOR
H. F. KING, M.B.E.

ART EDITOR
JOHN YOXALL

Editorial, Advertising and Publishing Offices:

DORSET HOUSE,
STAMFORD STREET,
LONDON, S.E.1.

Telegrams, Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:

COVENTRY
8-10 Corporation Street.
Telegrams, Autocar, Coventry.
Telephone, Coventry 5210.

BIRMINGHAM, 2
King Edward House,
New Street.
Telegrams, Autopress, Birmingham.
Telephone, Midland 7191 (7 lines).

MANCHESTER, 3
260 Deansgate.
Telegrams, Iliffe, Manchester.
Telephone, Blackfriars 4412 (3 lines).
Deansgate 3595 (2 lines).

GLASGOW, C.2
26b Renfield Street.
Telegrams, Iliffe, Glasgow.
Telephone, Central 1265 (2 lines).

SUBSCRIPTION RATES
Home and Overseas: Twelve months £3 3s. 0d. U.S.A. and Canada, $10.00.
BY AIR: To Canada and U.S.A., six months, $16.

IN THIS ISSUE:

Saab 91C Safir - - - 2
The Jubilee Dinner - - 7
The Sopwith Pup - - - 8
No. 65 (East India) Squadron - - - - 13
Discussing Production - 18
Supersonic Shapes - - - 20

The Merchant Airman

TRADITIONALLY the New Year is a time for good resolutions. We have all personally celebrated Christmas and the coming of the New Year, and as associates of a great industry we have been happy to be able to look back on a year's work well done. Now it is time to look and plan ahead, with peace and goodwill in mind.

One matter in which we have taken a special interest, and which, we recall, was the subject of our leading article exactly a year ago, is that of the training of new commercial air pilots. Since that time (and, in fact, since some months earlier, when this subject was first raised in *Flight*) a number of meetings have been held by interested bodies such as the Guild of Air Pilots and Air Navigators and the British Air Line Pilots' Association. We are told that officially "developments have been closely watched," "avenues have been explored," "possibilities have been (or will be) examined," "means sought" and "sympathetic ears turned"; but ministerial action to date has been precisely nil.

In the first place it is doubtful whether anyone who could start the ball rolling yet recognizes the need for a proper training establishment for airline pilots. To say the least, it seems highly illogical to sink millions of pounds in airliners and British airline development without making sure as well that there will be captains to command them and first officers to help fly them. It is not good enough to dodge the issue with a shrug and a "my friend Air Marshal Preston Longago assures me that the supply of redundant Air Force pilots will more than . . ."

A great number, the majority in fact, of British airline pilots today are ex-Servicemen, mainly R.A.F.-trained. After the war the best and the worst pilots, with ages ranging from 20 to 50, became available in large numbers. Some wanted to go on flying, others did not. The Corporations, themselves very young and relatively uncomplicated, could pick and choose, and cull after a trial period; finally, after continued training and experience, they could claim with justification to have assembled a first-class pilot team. But all this came about as a result of a once-only set of circumstances.

We have encouraged readers to express their opinions on the subject of training schemes in our columns and have applauded the good suggestions and deplored a tendency to get side-tracked into which-is-the-better-pilot arguments between Service and airline protagonists. We have also regretted another distracting influence for which B.E.A. have been in part and perhaps unintentionally responsible. We refer to the "We have plenty of pilots to meet foreseeable needs and increasing traffic will be looked after by larger and faster aircraft and more efficient employment" arguments. This simply puts off till tomorrow and confirms by admission of increasing responsibilities our contention that only the very best of specially trained pilots can be good enough for the airlines.

Of course, the biggest single difficulty to the setting-up of any training establishment or scheme is the wherewithal. Who should pay? We believe that it is accepted that British airlines—and not only the State-owned ones—are a national asset. The arguments used to justify the support and existence of the State Corporations apply in the main to the pilots also, although admittedly it is their work rather than themselves that brings in the foreign currency. But any good product has its value, and an operator who took on a fully trained young pilot from, say, a national school might reasonably be expected to contribute towards the cost of his early training as well as to provide additional training and experience after acceptance. To insist that parents also contribute might bar some of the most promising young men on financial grounds. This would be unfortunate, and a scholarship scheme with competitive examination is probably the better solution. It is to be hoped that both the Ministries of Civil Aviation and of Education will act without more delay. Were a start to be made tomorrow no commercially qualified pilot could emerge for three to four years.

The right kind of pilots of the right age in the right numbers and at the right time will not just happen to turn up. Neither will it be possible to get them from the Services, colleges, clubs or other airlines. No, it is high time to formulate a comprehensive national training scheme for commercial pilots. It must be based on a realistic appreciation of the value of the merchant air service and particularly of the men in it in years to come, without whom strings of British airliners will remain tied to the aprons on Mother Earth.

SAAB 91C SAFIR

Personal Impressions on a Brief Air Test

NOT long ago I had an opportunity to inspect and fly the Saab 91C and, being eager to sample this latest variant of an outstanding Swedish design, lost no time in motoring through the murk to Blackbushe. The weather was anything but auspicious for the projected flight. The Saab 91C—the first of this mark, registered SE-BYZ—was in England for A.R.B. certification, as reported in *Flight*, December 18th, and was held up at Blackbushe due to the bad weather. I contacted Bertil Andersson, the Saab test pilot who had flown it to England from Holland (where de Schelde are building Safirs under licence), and proceeded to look over the aircraft.

The first impression was that the 91C was much smaller than I had expected; it sat, squat and compact, on the tarmac, its highest points standing only a few inches above eye-level. It was indeed difficult to believe that this was a well equipped four-seat touring and sporting aircraft with a full 190 h.p. under its cowling, but closer acquaintance was to show it to be excellently designed, generously equipped and most pleasant to handle.

A comprehensive appreciation of the Gipsy-engined Saab 91A appeared in *Flight* of October 23rd, 1947. Since that time, two further versions of the Safir have been produced, both of them built by de Schelde. The first of these, called the 91B Safir, is a three-seat basic trainer, powered by a Lycoming 190 h.p. flat six engine; it is at present in general service with the Royal Swedish Air Force. This aircraft can be said to mark the half-way point between the 91A (Gipsy Major 10) and the 91C four-seater. The 91B has side-by-side dual control positions for instructor and pupil and an "observer's" seat behind the instructor on the right. The left-hand rear position is taken up by the fuel tank, with a small luggage compartment above it. The principal difference between the 91B and the 91C is that this fuel tank has been removed in favour of tanks in the wing roots; the baggage space is now in a compartment behind the cabin, and room thus cleared takes the fourth seat. The engine is still the same Lycoming 190 h.p. installation, and the external appearance of the aircraft has changed very little.

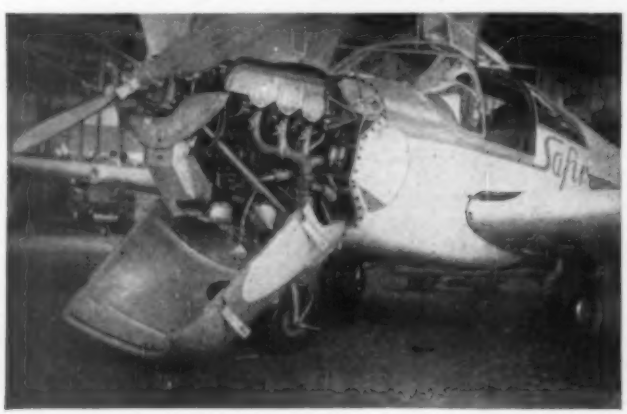
SAAB 91C SAFIR PERFORMANCE DATA
Lycoming 190 h.p.

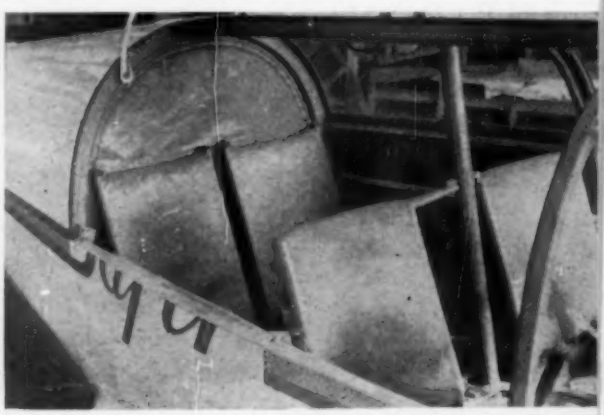
Take-off run to 50 ft	1,150ft
Landing run from 50ft	1,050ft
Max. normal range	620 statute miles
Stalling speeds with and without flap	59/67 m.p.h.
Max. speed	171 m.p.h.
Max. cruising speed, 75 per cent power	155 m.p.h.
Economical cruising speed, 60 per cent power	140 m.p.h. (s.l.) 155 m.p.h. (10,000ft)
Rate of climb at sea level	1,140ft/min
Service ceiling	20,500ft
Max. a.u.w.	2,560 lb
Max. weight for aerobatics	2,310 lb
Safety factor	1.5
Max. loading	+6g −3g

At Blackbushe I climbed into the 91C with Mr. Andersson and was shown the positions and functions of the numerous dials and knobs. Since the 91A, the central control panel between the seats has been somewhat modified. The three levers for elevator trim, flap and undercarriage are now mounted on a convex panel: the elevator trim, which is moved by depressing the lever, and sliding it backwards or forwards in the normal sense for "tail down" or "tail up," can also be finely adjusted by direct pressure against the friction lock; the flap lever works in a long slot, covered by a sliding panel, giving three positions, "up," "take-off" and "landing"; and the undercarriage lever next to it has a large oval rubber grip which is twisted through 90 deg for locking and unlocking. With undercarriage up, the lever is horizontal and out of the way. Rudder pedals can be disconnected and folded away, and either control column detached and stowed. A single centrally mounted pitch-control is fitted and there is a separate throttle for each pilot. The mixture control immediately below the central controls has three positions, "rich," "weak" or "idle cut off."

Landing, navigation and cabin light switches, and instrument

The Safir's cowling (left) fitted with quick-release fasteners, can be opened in a matter of seconds to expose the whole power-plant. The present austere furnishing (right) will be very much more luxurious in production aircraft.





To left and right are the 91C and 91B Safirs respectively. The 91C (below) can accommodate a stretcher patient and attendant. The wide-opening hatches allow easy access for loading and front seat and stick are quickly removable.

lighting dimmer switches are mounted centrally on the panel, together with starter button, isolator switch and engine instruments. Here also is a cover behind which are located all the aircraft electrical fuses. Pairs of fuses are held in rubber blocks and can easily be changed in flight should failure occur. The colour showing on the reversed rubber block indicates any fuse that has been replaced, thus facilitating subsequent servicing.

Three ventilators let air into the cabin, one to the feet and two past the windscreen. The starboard panel is taken up by radio equipment and a map locker. All flight instruments are positioned opposite the first pilot's seat, and in this first 91C there are six, with turn-and-bank indicator and simple magnetic compass in the centre. They include a variometer, altimeter, and A.S.I., but these are all calibrated in metres, kilometres per hour and metres per second; this was my first experience of metric instruments, and I was able to make practically no sense of them during the very short and rather harassed flight I was to make on that day. Also in front of the first pilot there are the priming pump, fuel cock (L., R., and reserve), carburettor hot-air control, emergency fuel pump and a small locker.

Saab 91B Safirs, built in Holland for the Royal Swedish Air Force, are shown here in service in Sweden.

The cabin of SE-BYZ is somewhat austerely but reasonably comfortably furnished, the seats all being quickly removable to allow for various types of load. This arrangement was fairly hastily put together on this particular aircraft, and I hear that Saab are at present engaged in designing a luxury interior. Considerable ingenuity has gone into designing the general cabin fittings: besides being readily removable, the front two seats can be adjusted for pitch. Compartments in the rear cabin floor hold toolkit, batteries and first-aid kit, all ready to hand.

Cockpit access, as on other Safir models, is through large upward-opening panels, two to starboard and one to port and, since the wing root is just above knee level, it is remarkably easy to climb in. Cloth sunblinds are fitted in the roof-lights and there is a clear-vision panel high in the windscreen for the port pilot. A cabin heater is also provided.

Even this equipment is by English light-aircraft standards lavish, but Saab intend further to provide A.D.F., a cabin clock, and such radio equipment as customers may require beyond the present eight-channel V.H.F. Another admirable fitting is the instrument lighting system, controlled by a rheostat. The lights are under the green instrument panel and each instrument is thus lit from the inside, causing no glare or reflection.

Mr. Andersson showed me that the starting procedure was admirably simple. The normal checks, pitch fine, throttle slightly open, mixture rich, fuel, right-hand tank; a few strokes to raise fuel pressure; two quick jabs at the priming pump; switch on—this with a normal car-type ignition key—and press the button. The engine started instantly, and idled quietly and smoothly. We now paused to warm up and made a final appraisal of the weather. It was forbidding, to say the least. A quick radio conversation with the tower showed 1,000 yd visibility in a mist which lay to over 1,000ft. The sun was almost set; in fact, a murky winter's day was drawing to its close.

With some hesitation we decided to try at least a quick circuit. None of our eight channels could provide us with a homing or let-down, and the compass was of the most freely swinging magnetic type. We strapped in (the harness, of the peg-and-clip type, seemed soft and rather flimsy after the sterner stuff one is accustomed to in Service aircraft). Mr. Andersson remarked that it was advisable to leave the shoulder straps a little loose in order to be able to lean forward to make the full travel of the undercarriage-raising lever.

Hatches closed and "no obstruction" checked, we taxied out. Once rolling straight, directional control could be comfortably maintained with rudder alone, at a speed of about 10 m.p.h. View over the nose was good, there being only very small blind area for about 25ft over the starboard bow. Turning, however, took some practice; once the nosewheel was appreciably deflected it was difficult to straighten out without a considerable burst of throttle; but, once this was accepted, the task was quite simple.

We arrived at the marshalling point and ran through the age-old litany of vital actions: Trim neutral, throttle friction nut tight, mixture rich, pitch fine; fuel, flaps take-off, instruments (still mostly incomprehensible in metres and kilograms). At this point a Viscount hummed out of the murk, passed close by and touched down out of sight in the fog. We exchanged looks, called for "line-up," and heard from the Viscount that visibility was now 900 yd.

We lined up, opened the throttle and bowled down the runway. Acceleration was smooth and there was no tendency to swing. At 90 to 100 km/hr (60 m.p.h.) the Safir came easily off the ground and I immediately reached, as previously instructed, for the undercarriage lever. A quick twist on the grip, a long, easy push forward and the wheels were up with no

(*Continued on page* 21)

FROM ALL QUARTERS

PROGRESS: Could the famous brothers have looked into the future, what would have been their feelings on seeing a Canberra circling the Wright Memorial at Kitty Hawk?

Those Fifty Years

ALL over the United States the 50th anniversary of powered flight was celebrated by meetings, air shows and dinners, each graced with eloquent utterance on subjects aeronautical. At Kitty Hawk, North Carolina, where the first flight was made, the hangar and living quarters of the Wright brothers were skilfully reconstructed on their original site. As already recorded in our columns, F/L. Burton and F/L. Gannon, winners of the England to New Zealand race, flew their Canberra P.R.3 across the Atlantic to Kitty Hawk from Wyton; on this page is a photograph of the aircraft passing near the Wright memorial. After landing at nearby Elizabeth City, the crew were then taken by helicopter to the celebration luncheon at Kitty Hawk. Later they laid a wreath at the foot of the memorial.

At exactly the time of the Wrights' first flight (10.30 a.m.) Billy Parker flew his old 1912 pusher biplane over the Kill Devil sands, and aircraft of many types flew past in salute.

In Washington, Gen. Eisenhower attended a dinner on the evening of the anniversary day, when Glenn L. Martin, himself one of the pioneers of American aviation, presented the annual Wright lecture. He predicted that the next 50 years would see space ships with speeds of 25,000 m.p.h. He also said he had "no hesitancy in forecasting for the next half-century of flight": (1) giant 200-passenger jet aeroplanes crossing the continents and the oceans "in literally zero time in the westerly direction"—this would mean flight in the neighbourhood of 1,000 m.p.h. to keep pace with the sun; (2) aircraft powered by atomic energy—first as bombers—capable of "multiple non-stop circumnavigation" of the globe; (3) helicopters carrying all airline traffic over distances up to 150 miles; (4) fully automatic airline flight operations with electronic guidance and control equipment; (5) flying-boats with speeds matching those of landplanes, but with greater capacity for cargo, passengers or weapons; (6) reductions to bring the cost of air travel well below that of any other form of transport.

Canberra's Two-way Cape Records

WE gave brief details last week of the Canberra point-to-point record between London and Cape Town on December 17th. This stands, subject to official confirmation, at 12 hr 21 min 3.8 sec. Thus the 6,009 statute miles between the city centres was covered at an average speed of 486.6 m.p.h. Two refuelling stops were made, at Castel Idris in Libya and Brazzaville in French Equatorial Africa. The refuelling times at these places, respectively 18 min and 23 min, are comparable with those of the England to New Zealand race. This flight has reduced by no less than nine hours the previous record of 21 hr 25 min set up in 1947 by a Mosquito P.R.34 (S/Ls. Martin and Sismore).

The record-breaking Canberra B.2 was to have returned to London Airport on Friday, December 18th, flown this time by W/C. A. H. Humphrey, with S/L. R. F. B. Powell and S/L. D. Bower as navigators. After some delay in departure from Cape Town because of fog at London Airport, the Canberra began the homeward flight on the 19th, reaching London in 13 hr 16 min 25.2 sec (454 m.p.h.). Subject to confirmation, this breaks a long-standing record over the route—Alex Henshaw's 39 hr 36 min established in a Mew Gull in 1939. Both the Canberra's flights were made against headwinds.

Appointments from Cranfield

NEW appointments for two members of the Department of Aerodynamics at the College of Aeronautics, Cranfield, have recently been announced. Professor A. D. Young, M.A., F.R.Ae.S., head of the Department, is to become Professor of Aeronautical Engineering at Queen Mary College, London University, on October 1st next, and Mr. A. H. Yates, B.Sc., B.Sc.(Eng), A.F.R.Ae.S., senior lecturer, has been appointed principal of Bath Technical College, and is to begin his duties there on April 1st.

Professor Young has been head of the Department of Aerodynamics at Cranfield since October 1950. Educated at the Central Foundation School and Caius College, Cambridge, he was engaged on research work under Professor Melvill Jones from 1935 to 1936, and was a member of the Aerodynamics Department of R.A.E. from 1936 until 1946, when he became senior lecturer and deputy head of Department at Cranfield. He succeeds the late Professor N. A. V. Piercy, D.Sc.(Eng.), F.R.Ae.S., who, until his death in February last year, had been Professor of Aeronautical Engineering at Queen Mary College since 1949. From 1934 until 1949 Professor Piercy had been University of London Reader in Aeronautics.

Mr. A. H. Yates—who is a regular contributor to *Flight*—has been a senior lecturer in Aerodynamics at Cranfield since 1946. He was joint author of *Some Aspects of Noise Propagation from Supersonic Aircraft*, a Cranfield report published last March.

Fifty Years on Film

TO celebrate the "Fiftieth Anniversary of Powered, Controlled Flight," two outstanding films have been produced showing the history of aviation during its first half-century. Both productions are the work of private firms, one British and the other American.

The British production is entitled *Powered Flight—the Story of the Century* and it is the work of the Shell Film Unit. The suggestion for such a film originated with the Royal Aeronautical Society, who quickly came to an agreement with the Shell company. B.E.A's two Peters, Masefield and his assistant Brooks, were then asked to plan and advise generally. Work began at the end of February 1953, under the guidance of a R.Ae.S. committee, of which Mr. Masefield was chairman.

Initially, twelve "nodal points" were fixed, marking events or developments of great significance. Around these the film was built up in perspective; and, although a subtitle reads "A study of Britain's contribution to the conquest of the air," the story is truly international and impartial. Research for celluloid penetrated to the Air Ministry, Central Office of Information, Ministry of Supply, R.Ae.S., and many private collectors.

Of the history itself, most of our readers—particularly those in possession of our issue of December 11th last—will need no further reminder. Our only comments and criticisms concern trivialities; sometimes, we felt, one development held undue sway while more could have been made of another; but the fact remains that this film provides all, and more than, we had expected. Dogfighting in the Kaiser war . . . barnstorming in the twenties . . . the beginning of real progress, in the thirties . . . the Battles of Britain and Europe . . . flying bombs and jet propulsion . . . and shots from recent Shell "Farnborough" films. Everything is here, properly related to the whole and treated in a truly authoritative manner.

The film is in black-and-white on six reels of 16mm or 35mm sound film. Copies will be made available on loan to societies and other bodies on application to the Petroleum Films Bureau, 29 New Bond Street, London, S.W.1.

The American film was to have been a joint effort by all the members of the American Aircraft Industries Association; in the event, the United Aircraft Corporation undertook the whole production, to which they have clearly accorded immense expenditure in time, man-power and money.

Human nature being what it is, this film bears little relation to the film described above. Entitled *We Saw it Happen*, the film uses as narrators most of the greatest pioneers in the American industry: Glenn Martin, Larry Bell, Donald Douglas, Chance Vought, Frederick B. Rentschler, "Dutch" Kindelberger, and such "top brass" as Generals "Hap" Arnold and Jimmy Doolittle.

Each takes up a particular line of development and relates his experiences of the past. And, personally, we found that the best part of the film was the insight which it affords into the character and personality of each of these great men who have helped to make American aviation what it is.

Of the material itself, we are unhesitant in recording that it does not quite match the Shell film in its properly related coverage of development. Rather too much time appeared to be taken up with setting the scene; and the whole film lacks any undercurrent of cohesion which, in the British film, traces the steady path of progress. And, of course, there are no Comets.

In spite of its reduced appeal to British audiences *We Saw It Happen* is a fine achievement, and we are glad to meet, so to speak, famous men who had previously been no more than a name, in most cases. No arrangements have yet been made for showing the film publicly, but a copy is in this country. Societies desirous of borrowing the film should communicate with Major J. R. Patterson, assistant to the president, United Aircraft Export Corporation, 3-5, Warwick House Street, London, S.W.1.

Captain Majendie Resigns

THE resignation from B.O.A.C. of Captain A. M. Majendie, flight captain of the Corporation's Comet fleet, was announced last week. He is to leave the Corporation in March, to become liaison officer in the research department of Smith's Aircraft Instruments Ltd. Sir Miles Thomas, chairman of B.O.A.C., is reported as saying: "Captain Majendie is leaving with our best wishes. Future aircraft will reflect the experience he has gained with us."

Captain Majendie has been with B.O.A.C. since 1946, before which he served with the R.A.F. Last January he was awarded the Queen's Commendation for Valuable Services in the Air.

Patrick Johnson Leaves Power Jets

LAST week we made brief reference to the retirement of Mr. W. E. P. Johnson from the Board of Power Jets (Research and Development), Ltd., and it is now possible to give further details. The Board state that they have reluctantly agreed to his relinquishing the joint managing directorship; he leaves at his own request, in order that he may be able to devote more time to his work as a technical consultant. Power Jets will continue to have his assistance in a consultative capacity. Mr. T. G. Hicks, who has been joint managing director with Mr. Johnson since May 1st, 1953, becomes managing director with effect from January 1st. Patrick Johnson was associated with Sir Frank Whittle from 1929 onwards in the patenting, and later in the development, of gas turbines. Having qualified as a patent agent in 1925, whilst serving in the R.A.F., he then became an instructor at the Central Flying School, and was conspicuous both for aerobatic flying and his pioneer work in blind flying. On leaving the Service, he practised as a patent agent but was called up again in 1939. He was seconded to Power Jets, Ltd., in 1940 and in one capacity or another has remained with that company and its successor ever since, being appointed managing director in 1948 and joint managing director in May 1953. He is also a member of the National Research and Development Corporation.

Mr. Johnson.

Mr. Hicks qualified as a patent agent in 1935 and was engaged in private practice until 1939. During the war, he served in the technical branch of the R.A.F.V.R., first as an armament officer in Bomber Command and then from 1943 onwards in Burma, where he became Deputy Command Armament Officer. In 1946 he joined the patents Branch of the Ministry of Supply, working at the Royal Aircraft Establishment, Farnborough, where he was responsible for the consideration, for purposes of patent protection, of all R.A.E. inventions other than those connected with electrical, radio and navigational instruments.

Mr. Hicks joined Power Jets in May 1950 as assistant manager and was appointed joint managing director in 1953.

Handley Page Staff Celebrate

THE annual staff dinner of Handley Page, Ltd., took place at the Café Royal, London, on December 22nd. Good food, good company and good entertainment were enjoyed by a large gathering of staff, their ladies and guests. Mr. R. E. Hardingham (chief executive and secretary of the A.R.B.) who proposed the health of the Company, praised its achievements, saying it had never gone in for only one side of aircraft production: it had always had military and civil interests and its contributions on the problems of fatigue were second to none.

"DEFENDER OF THE PEACE" is the caption to this fine study of a Hunter as presented on the Hawker Christmas card.

He recalled that the company was approaching its own jubilee [it falls in 1959.] He did not agree with those who described it as a one-man show; but again, there was no argument as to who was the boss!

The response was by Sir Frederick Handley Page who, accompanied by Lady Handley Page, presided. He talked mainly of domestic matters, in particular of the impending staff moves to Radlett, where it was planned to build 150 or 200 houses in addition to those already arranged. He remarked that the fine equipment at Radlett could be no good without equally good human equipment to use it, and in this connection spoke of the comprehensive technical training schemes for apprentices which had been arranged in conjunction with Northampton Polytechnic and Hendon Technical College. Sir Frederick also referred to the short courses which had been arranged at Cranfield and elsewhere for staff who wished to further their knowledge and position.

He went on to say that exchange of information within the organization was important; within the limits of security, everyone should know of the company's achievements and progress. Visits were being arranged from Cricklewood to enable employees to see the Victor fly.

A long-service presentation was made to the retiring machine-shop foreman, Mr. Wheeler.

New British Sailplanes

NOW at an advanced stage of construction are three new types of British sailplane, two of original design, and the third based on an existing high-performance machine. They should all be flying within the next few months and, if their performances are sufficiently impressive, may appear in the British entry for the world gliding championships in July and August.

Elliotts of Newbury are responsible for two. One is the development of Hugh Kendall's Crabpot 1 side-by-side two-seater which (as described in our issue of May 15th last) was to have been fitted with Durestos wings, but which is now to have wooden wings—of unconventional construction, it is believed. The Newbury firm have constructed these wings and have also made minor alterations to the wooden fuselage previously built by Miles, and the machine is now known as the K.1.

The second Elliott design is a modified version of the single-seat Olympia. The original fuselage and tail have been retained, but a new "laminar-flow" wing is being fitted. By retaining all of the original machine except the wings a clear indication of the relative qualities of old and new wing designs is expected. The wings of the new Olympia and the K.1 are based on different aerofoil sections, and it is hoped to begin flight tests of the sailplanes and evaluate their respective characteristics by the beginning of February. For the two-seater in particular there are high hopes for the international contest.

Slingsby Sailplanes are at present working on the T.42, a new tandem two-seater of just under 60ft span. Its construction incorporates a certain amount of plastics, and the totally enclosed cockpit has a full blind-flying panel and provision for oxygen. Scheduled to fly by the end of April, the T.42 was designed as a general-purpose two-seater for cross-country instruction. Although not specifically intended for competition flying, it would probably do better than existing types in the two-seater class of the international competitions. When put into production, it should certainly have a useful future with gliding clubs.

HERE AND THERE

Next Farnborough

THE S.B.A.C. has announced the dates of next September's Farnborough Show: Tuesday the 7th to Sunday the 12th inclusive.

New York Show

THE second "international aviation trade show" is to be held this year (May 5th-7th) in New York. There will be 98 stands on one floor of the 71st Regiment Armory, Park Avenue.

Good School

THE C-in-C. of the Norwegian Air Force, Lt-Gen. Finn Lambrechts, has announced the continuation of the training of Norwegian pilots in Canada; he signed a new three-year agreement during his recent visit to Canada.

Fiat's Sabres

THE first shipment of Sabre components for assembly by Fiat in Turin left the United States shortly before Christmas. To be designated F-86K, Fiat-built Sabres will have four 20 mm cannon instead of 24 × 2.75in rockets.

Honourable Veteran

A MAURICE FARMAN biplane which took part in the Tsingtao campaign—Japan *versus* Germany—in World War I was among the exhibits at powered-flight jubilee celebrations held by the Japanese Aeronautical Association.

For Boys of all Ages

MODEL aircraft exhibits—with a special helicopter feature—form a prominent part of the National Schoolboys' Own Exhibition, now open (10 a.m.-8 p.m. until January 13th) at the Horticultural Halls, Westminster. Admission is 1s.

PROGRESS IN TWO SCIENCES: Long-term patients in Davy Ward 3 at Clare Hall Hospital, South Mimms, hit on the ingenious idea of aircraft models and photographs as a motif in the hospital's Christmas ward-decorating competition. The theme linked progress in T.B. treatment with progress in aircraft design, and the skill of doctors with that of aircraft designers. An appeal made to the industry for the loan of models met with "a magnificent response."

Avon-Mystère Flies

THE first Marcel Dassault Mystère IVB, powered with a Rolls-Royce Avon RA.7 turbojet of 7,700 lb thrust, made its first two flights on December 16th, piloted by Colonel Rozanoff. The airframe is the first of a pre-production batch of Mystères, some of which will have the S.N.E.C.M.A. Atar and others Avons.

Rotor-hours Record?

HAROLD W. SYMES, a pilot of Helicopter Air Service, Inc., of Chicago, recently completed 3,000 hours of flying with that company. Before he joined them, in November 1949, he had flown 1,500 hours on helicopters, and it is believed that his total of 4,500 hours is a world's record for rotating-wing flying time.

For Recognition Teams

CLOSING date for entries for the All-England Recognition Contest has been extended to January 10th. Principal details of the event, which takes place on January 23rd, appeared on page 804 of *Flight* for December 18th. Entry forms are obtainable from the Hon. Secretary, Aircraft Recognition Society, 39/40 Bedford Street, Strand, London, W.C.2.

C.P.A. Comet Memorial

INSCRIBED "They gave their lives in the advancement of flight," a memorial has been erected in Karachi to the crew of the C.P.A. Comet which was destroyed there last March. Attended by the British and Canadian High Commissioners, the memorial was consecrated at a ceremony on December 17th.

Percival Appointment

CONCURRENTLY with the appointment of Mr. F. H. Pollicutt as chief designer to Percival Aircraft, Ltd., as recorded in *Flight* of December 4th, Mr. R. K. Page has been appointed chief technician. Thirty-eight years of age, Mr. Page joins the Luton firm from Westland Aircraft, Ltd., where he has been assistant chief designer (projects) for the past four years.

Sky-Sign

FOLLOWING successful installation of neon-light advertising on an Auster now operating in Singapore, equipment has now been fitted to a similar aircraft for use in this country. Frames measuring 11ft long by 2ft 6in wide, fitted under each wing, are each divided into 16 sections providing for the assembly of various neon-tube characters. A 24 v battery supplies current which is stepped up to 240 v by rotary converters, and then to 5,000 v by a transformer. The initial advertisement, in brilliant red and green, is for a well-known brand of cigarette.

PIONEERS OF BRITISH AVIATION gathered at Farnborough on December 14th to commemorate the fifty-year anniversary of powered flight. Here seen before the dinner—which we reported last week—in the Directors' Mess are (left to right), Sir George Thomson, Major F. M. Green, Sir William Farren, Mr. R. McKinnon Wood, Sir Geoffrey Taylor, Sir Melvill Jones, Mr. P. Crosson and Mr. S. B. Gates.

Take your Choice

"YOU may not fully comprehend the true magnitude of today's United States air power. But I will state unequivocally that it is superior to that of any other nation" —Admiral Radford, chairman of the American Joint Chiefs of Staff, in Washington on December 17th.

"The United States should have, but has not, the strongest air force in the world" —Gen. George C. Kenney, president of the Air Force Association, at a recent Press conference.

The offensive capabilities of the U.S.A.F. are now stronger (in quality though not in quantity) than those of the Russians "by a pretty good margin"—Gen. Twining, U.S.A.F. Chief of Staff, quoted by *United States News and World Report*, December 22nd.

THE JUBILEE DINNER

R.Ae.S. and R.Ae.C. Celebrate the Wright Anniversary

BEFORE proposing his toast—"The memory of the Wright brothers"—at the dinner in celebration of the 50th anniversary of powered, controlled flight, at the Dorchester Hotel, London, on December 17th, Sir William Farren, President of the Royal Aeronautical Society, read this message from Her Majesty the Queen: "I send my sincere thanks to the members and guests of the Royal Aeronautical Society and the Royal Aero Club dining together to celebrate the 50th anniversary of powered, controlled flight this evening for their message of greetings and for their good wishes to me and my husband, which we much appreciate." From Mr. C. J. McCarthy, President of America's Institute of the Aeronautical Sciences, and from the Australian and New Zealand Divisions and the Singapore Branch of the R.Ae.S. came other messages of greeting and good wishes.

Welcoming the guests (who represented a fair proportion of the 890 diners) Sir William asked to be forgiven if he did not mention them by name. There was, however, one exception—"one name above all"—which symbolized what this half-century had been, and it was that of Lord Trenchard. Sir William regretted that the American Ambassador was unable to be present, and took the opportunity to pay tribute to the achievements of the Americans. "They have been generous in their tributes to our work," he said —adding that what a craftsman valued most was the good opinion of a fellow craftsman.

Of the Wright brothers he remarked that we did not really know what aroused their interest in flying. Most of us, he said, had known a queer feeling which drove us to do something which we had no idea that we should ever do—or even that it would be good for us to try—and he thought that this was what happened to the Wrights. They were certainly not trying to make a fortune quickly; indeed, they were obviously aware that they might lose more than they could afford.

The history of what the Wrights did, Sir William said, was not always easy to follow, because they were men of few words and preferred to walk by themselves: they were like the Cat in Rudyard Kipling's *Just-So Stories*—but, to borrow a few words from that story, "they made the first flying magic in the world."

He concluded: "My own belief is that there was concealed within them the fire that burns in the breasts of all who fly for the love of it, and find in flying something for which there is no parallel in human experience. They were the first true airmen. Unless they had become airmen, they could not have completed their task, because a great part of their experimental work was done in flight. They were, for many purposes, their own measuring instruments. In the end they became masters of their craft—each a scientist, engineer, airman and artist combined. If my conception of what Orville and Wilbur Wright were is true —and I have little doubt that it is—we should not be surprised that they succeeded. It may be said that they had or needed luck. But what we call 'luck' in such adventures as theirs is the power to recognize the jade Opportunity as she flits by, to seize her before she vanishes or falls into the arms of others. Vision, insight, patience, judgment, courage—they had them all."

Proposing the toast of "The first generation," The Rt. Hon. A. T. Lennox-Boyd, Minister of Transport and Civil Aviation, recalled the message from Wilbur Wright reproduced in the December issue of the *Journal of the Royal Aeronautical Society* (wherein is contained a masterly monograph on *The Wright Brothers and the Royal Aeronautical Society*, by Capt. Laurence Pritchard, C.B.E., Hon.F.R.Ae.S., Hon.F.I.A.S., former Secretary of the Society). The message was dated May, 1909, and ran: "More than forty years ago, at a time when flying was little thought of in the world, some of the citizens of England banded themselves together to form this Society, and through all the years which have followed, during times when any talk about flying was considered ridiculous, and all the people who thought about it were laughed at, this Society met every season to consider the subject of flying, to report the work which its individual members had been doing, to publish these papers which we read, and to spread them throughout the world for the benefit of others."

Individual names mentioned by the Minister during the course of his speech were those of Sir Alliott Verdon Roe, Claude Grahame-White, Sir Geoffrey de Havilland, Sir Frederick Handley Page, Harold Perrin, Mrs. Hewlett, Sir Thomas Sopwith, Fred Sigrist, the Short brothers, G. Holt Thomas, Lord Trenchard and Sir Sefton Branckner. Of the Americans he particularly named Cody and Curtiss.

Lord Brabazon of Tara (described by the Minister as "head of all aeronautics in Britain," being President of the Royal Aero Club) then replied. The Club, he said, stood for the human side of flying. Through its portals all the great ones had passed, including the Wrights. He recalled that he knew Wilbur better than Orville, for it was Wilbur who came to Europe in 1908 and Orville who stayed in America. Wilbur he described as "curious, gaunt, polite, aloof," ready to talk to genuinely interested people but chilly and off-hand with those who viewed him as a curiosity. Wilbur and his great friend Griffith Brewer (described by Lord Brabazon as the Wright brothers' Boswell) greatly enjoyed each other's company. Their idea of happiness was to be in each other's presence—with neither speaking a word. Lord Brabazon went on to remark that one could find the equivalent of the Wright brothers in any provincial town.

In the course of his brilliant speech Lord Brabazon recalled how he introduced Wilbur to the great French constructor Voisin. Neither knew the other's language and throughout lunch they just sat and grinned at each other. Suddenly it was learned that the great Lebaudy airship was coming over, and the three ascended to the roof. Lord Brabazon was agog to hear *le mot juste* from Wilbur, and it came—"How very lucky to have seen that!" He once asked Wilbur if he would design him a machine to do 100 m.p.h. and was told that it was quite possible if he would provide the engine. The Wrights had a corner in their hearts for England, where they were treated well over their patents and were regarded as friends and not exhibits.

Lord Brabazon spoke very movingly about the pioneers. The runway of aviation, he said, was paved with the tombstones of those who had fallen by the wayside. Although there had been times when the word "aeroplane" stank in the nostrils of all decent men, the hope of the pioneers that air services would act as a shuttle to weave the fabric of better understanding was beginning to be fulfilled.

The occasion concluded with the showing of the film *The Story of the Century*, reviewed elsewhere in this issue.

CANBERRA TANKER

THE opening days of this New Year will see the beginning of trials with the first British jet aircraft to be equipped as a tanker for refuelling in flight. A converted English Electric Canberra B.2 (Rolls-Royce Avons), it has been loaned to Flight Refuelling, Ltd., by the Ministry of Supply to enable flight trials to be made with the latest developments in the probe-and-drogue system at high altitudes and high speeds. A Gloster Meteor 8 will initially act as the receiver and the experiments will be the first all-jet operations of their kind in Britain. In America (where the probe-and-drogue system had been tested by the U.S.A.F. and adopted by the U.S. Navy) a Boeing B-47B six-jet bomber has already been tested as a tanker.

The pilot of the Canberra will be Mr. T. C. Marks, D.F.C., chief test pilot of Flight Refuelling, Ltd., who has probably more experience in air refuelling operations than any other pilot in the world. The Meteor will be flown by Mr. P. R. Hornidge—the first pilot in the world to fly a receiver aircraft employing the probe-and-drogue technique. In 1948 he remained airborne in a Meteor for 12 hr 3 min with the aid of flight refuelling.

Conversion of the Canberra has been carried out at Tarrant Rushton and has merely involved the installation in the bomb bay of the hose-drum unit, which controls the flow of fuel and the "spring-blind" action of the hose. Sir Alan Cobham, chairman and managing director of Flight Refuelling, Ltd., states that the work has proved beyond doubt how simply a bomber can be turned into a tanker "without fuss or bother." Also, he says, it has disposed of the lingering idea that special aircraft must be built to act as tankers. He adds: "With this new equipment a bomber or transport aircraft, if equipped with the necessary fixed fittings, can be converted into a refuelling tanker in the minimum of time, as 70 per cent of the equipment required is already installed for the purpose of ground refuelling. The remaining 30 per cent can be added simply and quickly as a package unit."

Apart from the hose-drum unit, which is connected up to the Canberra's normal existing fuel, hydraulic and electrical system, the only other equipment which it has been necessary to instal is an operator's panel from which the operation is controlled. Measuring only 7in × 8½in, this is positioned in the cockpit.

THE SOPWITH PUP

Historic Military Aircraft : No. 6

By J. M. BRUCE, M.A.

"THE perfect flying machine" is the author's assessment of the Pup; but gentle as it was, it has a stirring combat history. The present article was preceded by five others of the series—D.H.4 (October 17th last), Bristol Fighter (November 7th), F.E.2 (December 12th), Handley Page 0/100 and 0/400 (February 27th), and S.E.5 (July 17th).

THE enthusiastic words quoted in the centre of this page were written by the diarist* of *War Birds: Diary of an Unknown Aviator;* they epitomise the feelings of many war-time pilots on first making the acquaintance of the Sopwith Pup.

In the classic simplicity of its lines the Pup bore the hall-mark of inspired design; so much so that it is easy to believe the legend of its origin, which tells of how Harry Hawker sketched his inspiration in chalk on the shop floor at Kingston, and how that first layout remained virtually unchanged throughout all the detail design which preceded the emergence of the prototype. To the Sopwith Company the machine was known as the 80 h.p. Le Rhône Single Seat Biplane, and its official title was simply the Sopwith Scout.

The name "Pup" was unofficial and was frowned upon by authority. Orders were issued forbidding the use of such a frivolously incorrect name for the aeroplane, but the Pup it was and the Pup it remained. The origin of the name and the identity of its inventor are alike obscure, but a more appropriate title could hardly have been devised, for the machine inspired in its pilots the same kind of affection as is lavished on a pet, and gave in return flying qualities which have probably never been equalled in any other aeroplane before or since. Perhaps the most remarkable feature of the Pup was its excellent performance on the mere 80 h.p. of its Le Rhône rotary engine, and the flying controls were harmonious and effective. The light wing-loading (which was just under 5 lb per sq ft) gave the machine a low landing speed and made it remarkably safe in forced landings.

"TODAY I saw my first scout machine, a Sopwith Pup. It's the prettiest little thing I ever laid my eyes on. I am going to fly one if I live long enough. They aren't as big as a minute and are as pretty and slick as a thoroughbred horse. Tiny little things, just big enough for one man and a machine gun."

The Pup bore a family resemblance to its immediate predecessor, the Sopwith 1½-strutter, but its design owed a good deal to a little single-seat biplane, powered by a 50 h.p. Gnôme, which had been built in 1915 to the ideas of Harry Hawker. Indeed, it seems probable that it was this machine which was designed on the shop floor by Hawker. This aeroplane was rather smaller than the later Pup, and its centre-section struts were vertical when seen in end elevation: those of the Pup splayed outwards. However, the plan-form of wings and tail-plane were similar to those of the Pup, having the characteristic cut-back shape which later became so familiar, but on the early machine wing-warping was used for lateral control. The aircraft was employed by Harry Hawker as a personal means of transport, and was popularly known as "Hawker's Runabout."

The Pup also owed something to experience gained in service with an even earlier Sopwith single-seater, the Tabloid of 1913, which was one of the first high-speed single-seat scouts to go into production for the British flying services. In its day the Tabloid was also officially known as the Sopwith Scout, and official statistics under that heading include both Tabloids and Pups, but it seems most probable that, between October 1914 and June 1915, 36 Tabloids were built for the R.F.C. and R.N.A.S. A small number of Tabloids had been completed before the outbreak of war. The type did not form the complete equipment of any Service unit, but did some good work in the early days of the war, including the bombing attacks made on October 8th, 1914, by Squadron Commander Spenser Grey and F/L. R. L. G. Marix. Spenser Grey bombed Cologne, and at Düsseldorf Marix destroyed the Zeppelin shed and the airship it housed. The Tabloid's success as a military machine is the more commendable because it was built for demonstration and sporting flying. The Pup was designed as a fighting scout.

Simplicity was the keynote of the Pup's design, structurally as well as aerodynamically. The four longerons of the fuselage were of 1½in square ash, and the vertical and horizontal spacers were of spruce. Most of the cross-bracing was of 14-gauge wire, but the forward three bays of the fuselage were braced with 10- and 12-gauge wire: the front bay had substantial diagonal struts of ash, and a fire-proof bulkhead was fitted. The oil and petrol tanks were situated immediately behind this bulkhead. Forward of the cockpit the top cowling was a sheet of 22-gauge aluminium, its rounded contour being continued down to the tailplane by a conventional top-decking of ¾in × ¾in stringers notched into ¼in birch three-ply formers. The circular engine-cowling was faired off to the flat sides of the fuselage by tapered fairings: these fairings consisted of 3/16in x ¾in spruce stringers on formers, of which there were four on the port side and five on the starboard. The forward bay was covered with aluminium sheet, and the remainder of the fuselage was covered with fabric, except for the top-decking in the immediate vicinity of the cockpit, which was of ¼in plywood. Strips of ¾in x ¼in spruce ran almost the full length of top and bottom longerons on the outside in order to hold the fabric ¼in clear of the fuselage structure. On the starboard side of the fuselage the covering aft of the cockpit consisted of a laced-on panel of fabric: there was no lacing on the port side.

The mainplanes had spruce spars, spindled out for lightness and connected by four compression struts. The two inboard bays of each wing panel were cross-braced by 12- and 14-gauge

* Now known to have been J. M. Grider, an American who flew in No. 85 Sqn., R.A.F.

In this view of a standard R.F.C. Pup the location of the single fixed Vickers gun is seen to advantage.

THE HAWKER HUNTER,

THE VICKERS SUPERMARINE SWIFT,

THE ENGLISH ELECTRIC CANBERRA,

THE VICKERS VALIANT

and

THE DE HAVILLAND COMET II,

are all powered by the

ROLLS-ROYCE

AVON

AERO ENGINE

Jubileeve in flying?

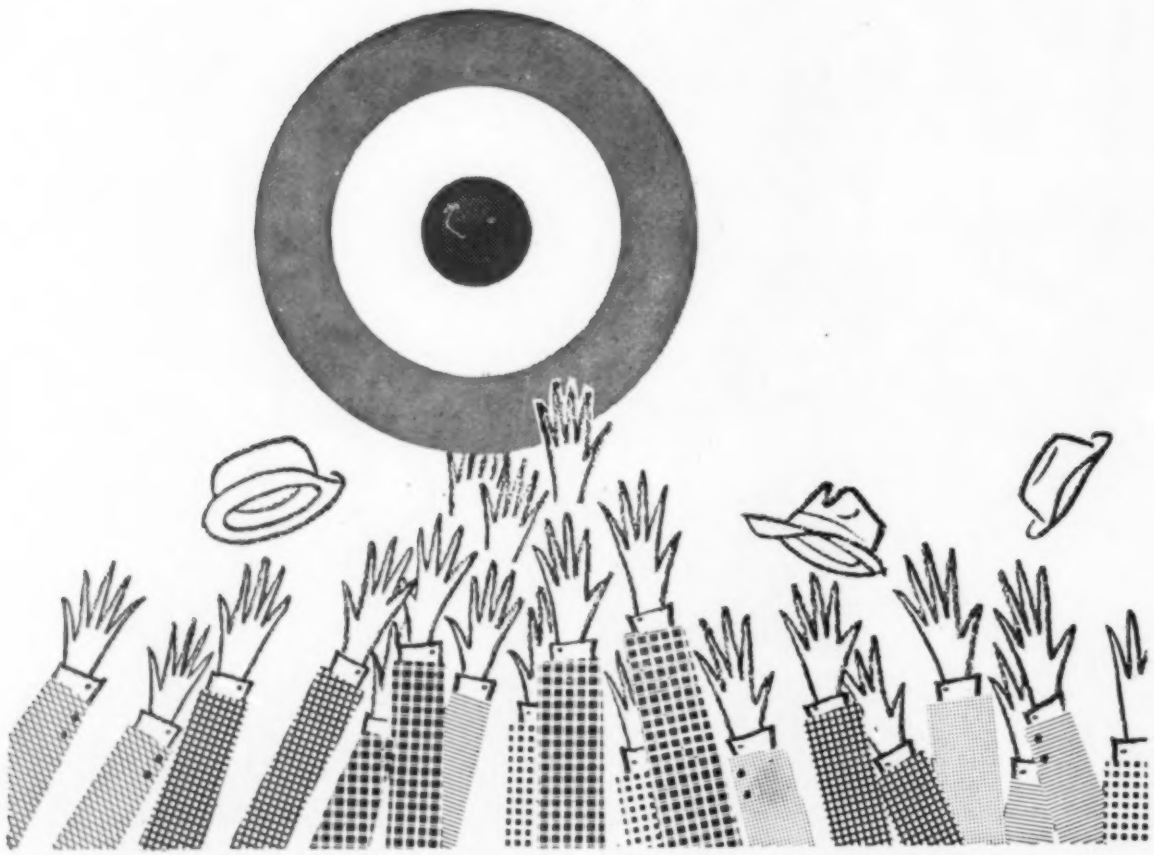
1903 Orville Wright flew for **12 seconds**

1953 to the Cape by Canberra (Rolls-Royce engines)

in **12** hours **21** minutes on

SHELL **AVIATION TURBINE FUEL**

Well done **R.A.F.**



SHELL-MEX AND B.P. LTD., Shell-Mex House, Strand, London, W.C.2.
Distributors in the United Kingdom for the Shell and Anglo-Iranian Oil Groups.

THE SOPWITH PUP . . .

wire. The ribs were of spruce, and birch riblets were added between the ribs to preserve the nose contours of the wing section. The wing tips were of ⅛in x 20-gauge mild steel tube, and the trailing edges were of formed 22-gauge tube. The surprisingly small ailerons were hinged to the rear spars. Production Pups had two different forms of centre section, those R.N.A.S. machines with the aperture for an upward-firing gun having revised cross-bracing. Many Pups had part of the centre section covered with transparent material to improve upward view. Interplane and centre section struts were of spruce.

The tailplane had a wooden main spar, leading edge, ribs and riblets: the rear spar was of ⅛in x 22-gauge mild steel tube, as was the leading edge of the elevators. The elevator assembly was made of steel tube throughout, all joints being brazed. The tailplane tips were also formed of steel tube, and three wooden compression struts were fitted between the spars, cross-bracing being of 16-gauge wire. The entire fin and rudder assembly was made of steel tube.

The undercarriage was structurally similar to that used on the 1½-strutter, and was of the form which came to be recognized as typically "Sopwith." It consisted of two plain vees of streamline-section steel tube, the apices of which were connected by two spreader bars of steel tube. Each wheel was mounted on a half-axle which was pivoted by its inboard end at the mid-point of the spreader bars and bound by rubber cord to the apex of the appropriate vee strut. The whole structure was cross-braced, and a single vertical wire braced the mid-point of the axle assembly to the bottom of the fuselage. The wheels had 700 x 75 mm Palmer tyres.

The complete machine had the fine lines of a thoroughbred, and was certainly one of the prettiest aeroplanes ever built. In the air it was easily recognizable by the cut-black plan-form of wing tips and tailplane. The Pup was essentially a pilot's aeroplane. The controls were light and sensitive, the elevators being particularly powerful. The aircraft retained its wonderful controllability even at 15,000ft, and in any battle of turns at that altitude it could easily outmanœuvre any contemporary German fighter without losing height.

The first Pup to see service in France arrived there at the end of May 1916, and was sent to Naval "A" Fighting Squadron at Furnes, probably for service trials. Some two weeks later the first Sopwith Triplane was also sent to Naval "A," and the two aeroplanes created a sensation with their speed, tractability and rate of climb. Sopwiths were at that time contractors to the Admiralty, and the earliest production Pups were built for the R.N.A.S. Nearly all of the R.F.C. Pups seem to have been built by the Standard Motor Co. and by Whitehead Aircraft Ltd. The first production batch did not begin to appear until the third quarter of 1916: by the end of that September ten machines had been delivered.

No. 1 Wing of the R.N.A.S. seems to have been the first Service unit to use the Pup in quantity, for it is recorded that the Wing provided six Pups to equip one flight of No. 8 (Naval) Squadron late in October, 1916. The other two flights of the squadron were equipped with Nieuport Scouts and Sopwith 1½-strutters, and the squadron made its first patrol on November 3rd. The Pups quickly demonstrated their superiority over the opposing fighters, and Naval Eight soon wanted more of the type instead of its 1½-strutters and Nieuports. It was agreed between General Trenchard and Wing Captain C. L. Lambe (then responsible for the Dover-Dunkirk group of R.N.A.S. air bases) that the 1½-strutters should be replaced by Pups, and this was done on November 16th, 1916. The Nieuports were also replaced gradually, and by the end of the year the squadron was completely equipped with Pups. To achieve this, Wing Captain Lambe had had to undertake to provide the necessary 80 h.p. Le Rhône engines. These he obtained by salvage from crashed Nieuports, and a few he wheedled out of the French Naval air service. The overhaul of these engines was carried out at the Dunkirk station, after which they were shipped to Dover for installation in Pup airframes.

Naval Eight's record over the Somme was impressive. Between October 26th and the end of December 1916, twenty of the twenty-four enemy machines destroyed by the squadron fell to the Pups. By March 28th, 1917, the squadron was re-equipped with Sopwith Triplanes, but the Pup gave sterling service during the Battles of Arras in the hands of No. 3 (Naval) Squadron and of R.F.C. Squadrons Nos. 54 and 66.

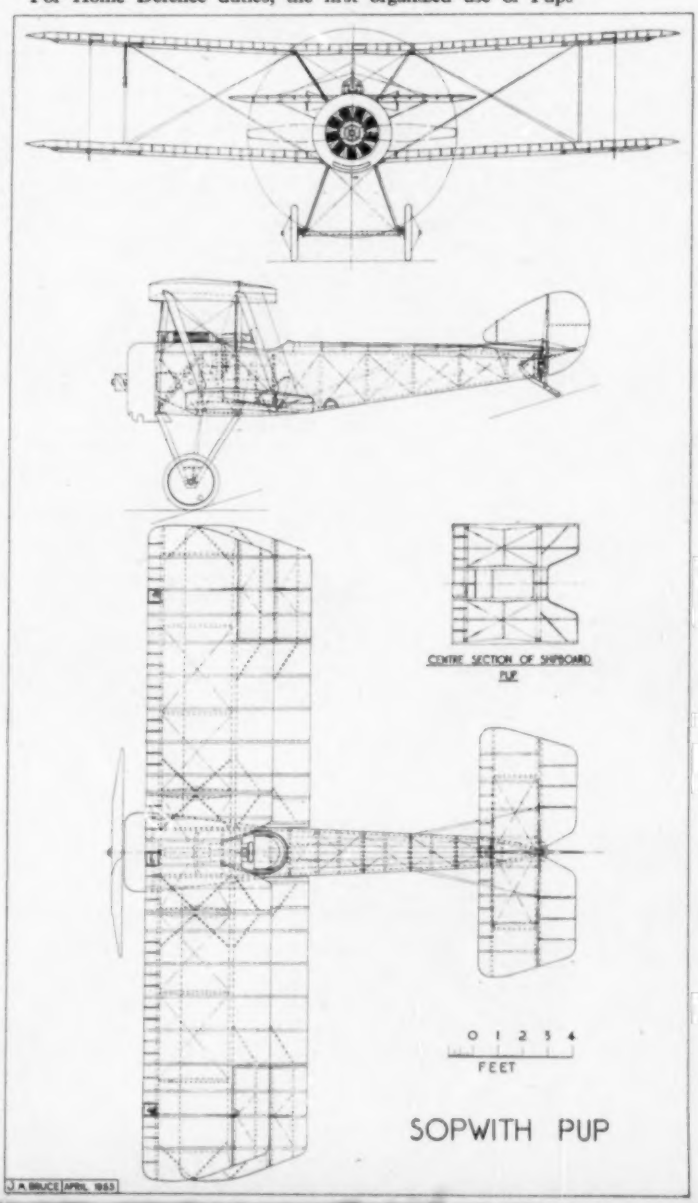
No. 54 was the first R.F.C. unit to take the Pup to France, and it arrived there on Christmas Eve, 1916. No. 66 Squadron followed on March 6th, 1917. The only other R.F.C. squadron to use the Pup on the Western Front was No. 46 Squadron, which relinquished its Nieuport two-seaters on re-equipment in April 1917.

The Pup convincingly proved its excellence over the Arras battlefields on many occasions. On April 6th, 1917, five of No. 3 Naval Squadron's Pups, led by F/Cdr. T. C. Vernon, were escorting a bombing formation of B.E.s and attacked four Halberstadts which were getting into position to attack the bombers. Vernon shot the wings off one Halberstadt, Sub-Lt. J. S. T. Fall shot another down in flames, and the remaining two broke up in the air under the combined fire of the B.E.s and the other Pups. Sub-Lt. Fall distinguished himself in a combat over Cambrai five days later when, as one of the escort to five B.E.s of No. 4 Squadron, R.F.C., he shot down two Albatros scouts and a Halberstadt. These victories contributed to Three Naval's impressive score of eighty enemy aircraft shot down between the beginning of February and the middle of June 1917: the squadron's losses during that period were only nine.

The Pup continued to give good service with the R.F.C. and R.N.A.S. throughout the Battle of Ypres and Cambrai, but it began to be outclassed by the autumn of 1917. Its single Vickers gun denied it a satisfactory volume of fire, and towards the end of its active service with No. 54 Squadron a few pilots of that unit added a Lewis gun above the upper wing. The idea was soon abandoned, however, for it was found that the additional gun and mounting weakened the centre section and made the Pup heavy on the controls. The Pup squadrons also dropped bombs on occasion, up to four 25lb bombs being carried. No. 66 Squadron carried out several bombing attacks during the Battle of Ypres.

To the end of its service on the Western Front the Pup remained useful because of its height-holding capabilities. In this respect it was superior to the later and more powerful D.H.5, and when mixed formations went out on offensive sweeps the aircraft were usually disposed with the Pups at about 15,000ft, Bristol Fighters at 12,000ft, and D.H.5s at 9,000ft.

For Home Defence duties, the first organized use of Pups



THE SOPWITH PUP . . .

was the withdrawal to Calais of No. 66 Squadron on June 21st, 1917, at the same time as No. 56 (S.E.5) Squadron was sent to England for the same purpose. These moves were made as a result of the public demand for improved defence of the London area after the daylight raid on June 13th, made by fourteen Gothas, but the withdrawal of these two fighting squadrons during the Battle of Messines was severely felt on the Western Front. However, No. 66 Squadron was sent back to its normal duties on July 6th, 1917, after a more or less uneventful sojourn at Calais. The squadron was not told until too late of the raid of July 4th and missed the Gothas returning from Harwich, but five R.N.A.S. Pups from Dunkirk met the enemy about 30 miles N.W. of Ostend. F/Cdr. A. M. Shook and F/Sub-Lt. S. E. Ellis were both rewarded by seeing their targets fall emitting smoke.

On the day after Nos. 56 and 66 Squadrons rejoined the B.E.F., the Gothas again raided London in daylight. On July 10th, No. 46 Squadron flew its Pups to Sutton's Farm, Essex, for Home Defence duties, and did not return to France until August 30th. Its return to the B.E.F. was made possible by the creation of three new Home Defence squadrons, two of which were equipped with Pups. These were No. 112 Squadron, formed at Throwley on July 30th, and No. 61, formed at Rochford on August 2nd, 1917.

No. 61's Pups were in action on August 12th, when they pursued ten Gothas which had bombed Rochford, Leigh, Westcliff and Southend, but the bombers had too great a lead over the defenders and such combats as took place were brief and indecisive. One of the Gothas was shot down by an R.N.A.S. Pup from Walmer, flown by F/L. H. S. Kerby.

Some of the Home Defence Pups were fitted with the 100 h.p. Gnôme Monosoupape engine, which improved the rate of climb considerably and added 1,000ft to the machine's ceiling. These Pups could usually be distinguished by their "horse-shoe" engine cowlings, the lower portion of which was removed to facilitate the escape of the exhaust gases. Many attempts were made to fit a forward-firing Lewis gun on the upper wing of the H.D. Pups, but with no more success than No. 54 Squadron enjoyed with the same idea.

The Pup displayed much of the same type of versatility which distinguished its illustrious descendant, the Hawker Hurricane, in the recent war. The Pup went to sea in many forms and in many ships. The Sopwith Baby seaplanes had proved to be ineffective as an anti-Zeppelin weapon, and in February, 1917, the Grand Fleet Aircraft Committee recommended that the Baby seaplanes carried by H.M.S. *Campania* should be replaced by Sopwith Pups. This was agreed to, and a few Pups were sent to the ship for experimental work. Seaplanes had flown off *Campania's* deck, using detachable wheels under their floats and a special runway to hold the tail up at the normal flying attitude at the beginning of the take-off run. For the use of the Pups this latter device was developed into an elevated grooved tubeway, and became known as the tail guide trestle. Pups also replaced Babies in the *Manxman*, a former Isle of Man steamer which had been converted into a seaplane carrier. The *Manxman* had four Pups, and the *Furious*, a converted large light cruiser commissioned as an aircraft carrier in July, 1917, had five.

A more remarkable development was the flying of Pups from special platforms on light cruisers. The first of these was mounted above the conning tower and forecastle gun of the *Yarmouth*, and gave a run of no more than twenty feet. Surely no greater tribute could be paid to the Pup's flying characteristics. The first take-off, in a felt wind of 20 knots, was made by Flt. Cdr. F. J. Rutland in June, 1917, and the success of this trial led to the decision to fit flying-off decks to one ship in each light cruiser squadron: the ships selected were the *Caledon*, the *Dublin*, the *Cordelia*, and the *Cassandra*. Emphasis was laid on the usefulness of ship-borne fighters on August 21st, 1917, when the *Yarmouth*, complete with Pup, was escorting minelayers off the Danish coast. A Zeppelin, the L.23, appeared at about 5.30 a.m., and an hour later, when the airship had been lured farther away from her base, Flt. Sub-Lt. B. A. Smart took off from the *Yarmouth* and climbed until he was 1,500ft above the Zeppelin. He attacked in a dive which brought him to within twenty yards of his adversary: the L.23 burst into flames and burned fiercely until its remains fell into the sea. Smart ditched his Pup near the *Prince*, and was picked up. His machine was lost.

F/Cdr. Rutland also pioneered another form of shipboard take-off later in 1917. It had been suggested by Lt. Cdr. C. H. B. Gowan that aeroplanes could be flown off a rotatable platform which could be turned into the felt wind without necessitating a change in the ship's course. A ship's gun turret offered a ready-made turntable, and experiments were carried out in the battle cruiser *Repulse*. A sloping platform was built on "B" turret, and a special tail guide trestle as used in the *Campania* ensured that the aeroplane was held in flying position. Rutland made the first take-off in a Pup on October 1st, 1917, in a felt wind of 31½ m.p.h., with the turret trained 42 deg on the starboard bow, and repeated this performance from the battle cruiser's after turret on October 9th.

Experiments were also carried out with aircraft catapults. The U.S. Navy had been using catapults since 1912, and had three ships fitted with this launching device by 1916. It was not until that year, however, that tenders were invited for the construction of a British catapult. The specification required the catapult to be capable of launching an aeroplane weighing 2½ tons at 60 m.p.h. with an acceleration not exceeding 2.5g in a distance of 60ft. Two examples were built, each using compressed air. The first, designed by R. F. Carey, was tested with a Sopwith Pup at Hendon in October, 1917. Neither type of catapult proved to be a success, however, and the experiments were abandoned.

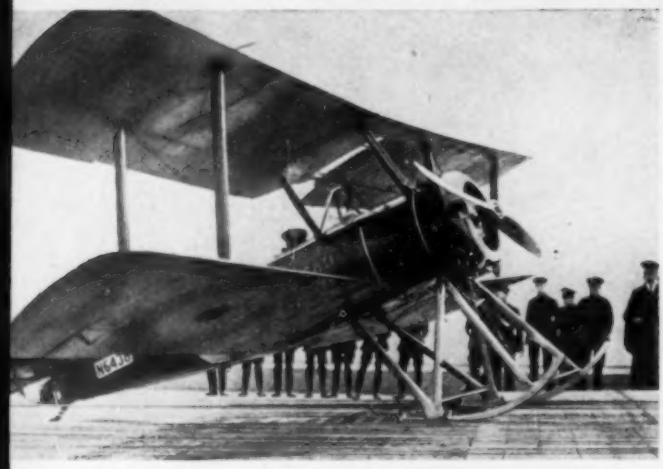
The Pups which were flown from ships had air bags in the rear portion of the fuselage, but these were not over-effective. On April 29th, 1917, F/Cdr. Rutland was lucky to be rescued after ditching his Pup near the Danish coast. He had flown off from the *Manxman* on an anti-Zeppelin patrol but compass trouble had caused him to lose his parent ship. The Pup floated for only twenty minutes, and Rutland was rescued by fishermen. He was released as a shipwrecked mariner, and rejoined the *Manxman* at the end of May.

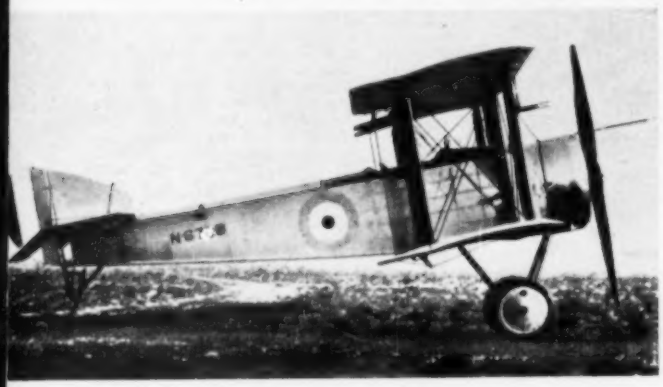
Improved flotation gear was developed at Port Victoria, much of the work being carried out by S/Cdr. H. R. Busteed. Cylindrical air bags were fitted under the forward spars of the lower wings of a Pup and when deflated lay flat against the underside of the wing, where they had no appreciable effect on the machine's performance. Inflation was by compressed air from a standard compressed-air starting bottle. The first Pup to be fitted with the gear had a jettisonable undercarriage which was released before touching down. When the aeroplane struck the water on the first attempt the fabric was ripped off the underside of the fuselage and the machine turned over. To prevent a recurrence of this trouble a hydrovane was fitted between the undercarriage strut attachment points just below the fuselage, and a sheet of duralumin was fitted at a negative angle on the tail-skid in order to keep the tail down with the machine in the water. Thus modified, the machine was successfully ditched several times and remained afloat for some hours.

Pups fitted with air bags were used by a special fighter flight of the R.N.A.S. which was established in the middle of May, 1917, for the protection of merchant vessels in the Downs. This flight was located at Walmer.

Obviously, ditching was the most wasteful way of concluding

A Pup with 100 h.p. Gnôme Monosoupape engine. (Below) An experimental Pup, fitted with a sprung skid undercarriage.





A Pup with a rigid skid undercarriage. (Below) Beardmore S.B.3D with wings and undercarriage extended.

a flight, and thought was given to the question of landing on the flight decks of ships at sea. Experiments were carried out in the *Furious*, and it is doubtful whether any other aeroplane but the Pup could have been used in them. The *Furious* had the conventional ship's superstructure, and the 228ft flying deck lay ahead of it. To land-on, therefore, it was necessary to fly past the superstructure and then to get over the deck as quickly as possible. Preliminary trial flights made with the ship in harbour showed that this could be done in a Pup, and the first landing was carried out by S/Cdr. E. H. Dunning on August 2nd, 1917. His Pup was fitted with rope toggles at the wing tips and under the fuselage, and by these the machine was pulled down to the deck manually as soon as Dunning had crabbed in over the deck centre line. This gallant officer repeated this feat successfully but was killed in a third attempt on August 7th.

Later, in March, 1918, the *Furious* was fitted with an after deck, 284ft x 70ft, for landing-on, and arrester gears were introduced. While *Furious* was in course of being modified, S/Cdr. Busteed had been experimenting with various experimental forms of arrester gear at Port Victoria. Once again the Pup was the aircraft selected for these trials, and it was ultimately found possible to bring a Pup to rest after a run of only fifty feet, using a system of transverse cables attached at each end to sandbags, and engaged by a hook on the aircraft. The wheel undercarriage of the Pup was not too satisfactory in actual landing-on, however, for the machine's low landing speed placed it at the mercy of oblique gusts and the roll of the ship. Accidents occurred in which tyres were rolled off the wheels, and experiments were forthwith made with undercarriages in which the wheels were replaced by wooden skids.

At first, the skid undercarriage retained the rubber shock-cord springing, but this was later discarded and the whole structure was made rigid. Strangely enough, the skid-fitted Pups could take off from any normal grass aerodrome just as easily as the standard machines, the landing run was appreciably reduced, and the general performance was slightly improved. These Pups with skid undercarriages were used in the *Furious*, and the form of arrester gear used in that ship consisted of longitudinal cables which were engaged by special clips on the aircraft's undercarriage.

The problem of conservation of space on board ship also received attention once aircraft carriers had been accepted as workable propositions. Folding wings were not new in 1918, having been used on many types of Short seaplanes, the Fairey F.2, and the Handley Page 0/100 and 0/400, to mention only a few examples. A specially modified version of the Pup was produced by William Beardmore and Co., and had not only folding wings but a folding undercarriage as well. This machine had the Beardmore type number W.B.III, but was officially known as S.B.3D. It was produced in quantity: on October 31st, 1918, 37 S.B.3Ds were with the Grand Fleet and 18 were in store.

The modifications to the basic design were somewhat drastic. The fuselage was lengthened by about a foot, and the mainplanes were rigged with reduced dihedral and without stagger. This meant that the lower wing was further forward and the upper wing further aft than on the Pup. The mainplanes were hinged at the rear spar, and additional interplane struts were inserted at their inboard ends to preserve the truss with the wings folded. The centre section struts of the normal Pup were replaced by four full-length interplane struts connecting upper and lower centre sections: these struts were joined to the upper longerons by short transverse struts. On the protoype S.B.3D, No. 9950, the ailerons were operated by control rods in a similar fashion to those of the Nieuport Scout, and the control surfaces were connected by a rod. On production machines, however, some form of the more usual cable system of operation seems to have been used, and the ailerons were connected by a cable. Span and wing area were reduced because of the smaller centre section, and the loaded weight was slightly lower than that of the Pup. The undercarriage was an ingenious structure. It was a normal vee type when extended, but could be folded very neatly into the bottom of the fuselage, leaving half of each wheel protruding, and could also be jettisoned completely if the areoplane had to alight on the water. Emergency flotation gear was fitted as standard equipment.

Despite the radical modifications to the basic design, the speed of the S.B.3D was little below that of the Pup, but its rate of climb was considerably reduced. The type was used in H.M.S. *Furious*, the maximum number carried being fourteen, but there is no record of any action in which S.B.3Ds took part. Strange as it may seem, a note in the 1920 edition of Jane's *All the World's Aircraft* indicates that in that year Japan had some S.B.3D machines on the strength of her Naval Air Service. It seems that some form of the Pup was built in Japan in small numbers, but whether the Japanese-built machines were true Pups or S.B.3Ds is uncertain.

The armament of the shipboard Pups usually consisted of a single Lewis gun mounted on a tripod immediately in front of the cockpit. An aperture was provided in the centre section, and the gun could fire either upwards and forwards over the airscrew or almost vertically upwards. Other R.N.A.S. Pups had the standard armament of one synchronised Vickers gun, and experiments were carried out with Le Prieur rockets. Eight were carried, four on each pair of interplane struts.

Production continued right up to the Armistice: indeed, the greatest output of Pups was achieved in the first quarter of 1918, in which period 500 were built.

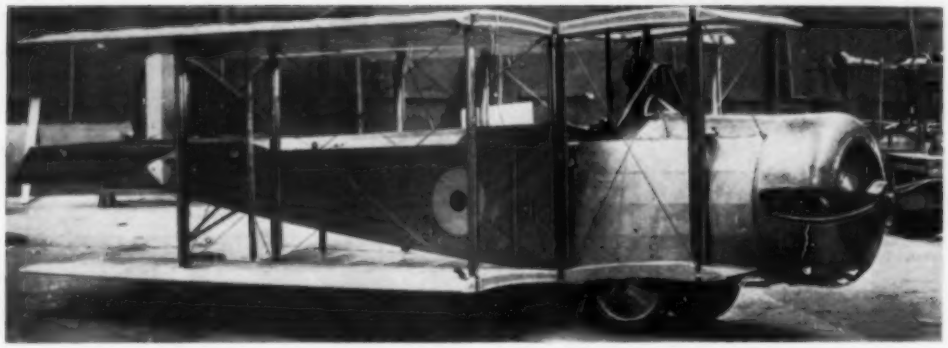
Since the Pup had been derived from Hawker's Runabout of 1915 it was fitting that from the Pup should be derived Hawker's next personal aeroplane. This was the diminutive Bee, which, powered by a 50 h.p. Gnôme and with a span of only 16ft 3in, embodied a number of Pup components. The Sopwith Sparrow radio-controlled biplane also owed something to the Pup; so (but to a lesser extent) did Britain's first radio-controlled aeroplane, a little monoplane built in 1916 for Professor A. M. Low's experiments: its mainplanes were the lower wings of a Pup.

After its withdrawal from squadron service at the end of 1917, the Pup was widely used by Training Squadrons, and was eagerly sought after by senior officers for their personal use. At the Gosport School of Special Flying there was at one time a Pup which was painted all over in black and white stripes: It was flown by Captain Foote. Individualistic markings were characteristic of the Pup, and it was the last British type to carry pilot's personal markings in squadron service. To the end it remained a pilot's aeroplane in every respect.

A number of Pups survived the Armistice, but only a handful went on the British Civil Register. The basic design was developed into a little two-seater, known as the Dove, which was produced in some numbers in 1919. All the Doves save one had slightly swept-back wings of only 25ft span. The straight-wing Dove, registered G-EBKY, was rebuilt to resemble a Pup by Warden Aviation, Ltd., in 1936, and is still flying today, wearing the serial number N.5180. This machine differs from the true Pup design in several ways, however, and is not a wholly accurate reproduction of the original Pup N.5180. Perhaps the last genuine Pup was the one reported to be at Geelong West, Australia, in 1937.

Whatever praise may be rightly given to the many good aeroplanes which fought and flew during the first World War, the Sopwith Pup occupies a unique place in our aircraft history as the flying machine in which were combined the maximum number of virtues. Obedience, agility and tractability were among its most desirable characteristics, and above all it possessed

THE SOPWITH PUP . . .



The prototype S.B.3D, with wings and undercarriage folded. (Below) Salvaging a Naval Pup after ditching trials.

a simple beauty of line which stamped it as the little masterpiece it was. It looked right and it was right.

This has been said before, many times and by many people, but it will bear repetition: the Sopwith Pup was the perfect flying machine.

PUP AND S.B.3D DATA

Power Plant.—Pup: 80 h.p. Le Rhône 9C (max. output 93 h.p. at 1,200 r.p.m.); or 100 h.p. Gnôme Monosoupape. Beardmore S.B.3D: 80 h.p. Le Rhône 9C.

Manufacturers.—The Sopwith Aviation Co., Ltd., Canbury Park Road, Kingston-on-Thames.

Other Contractors.—The Standard Motor Co., Ltd., Coventry, known batches, A.626-A.675, A.7301-A.7350, B.1701-B.1850, B.5901-B.6150, C.201-C.550; Whitehead Aircraft, Ltd., Richmond, Surrey, known batches, B.2151-B.2250, B.7481-B.7580, C.1451-C.1550, D.4011-D.4210; William Beardmore and Co., Ltd., Dalmuir, Dunbartonshire (Pup and Beardmore S.B.3D), known batches, N.6100-N.6129, N.6680-N.6749.

Production.—1,770 built; 64 in 1916, 973 in 1917, 733 in 1918.

DIMENSIONS, WEIGHTS AND PERFORMANCE, PUP AND S.B.3D

	Pup 80 h.p. Le Rhône	Pup Monosoupape	S.B.3D
Span	26ft 6in	26ft 6in	25ft
Length	19ft 3⅜in	19ft 3⅜in	20ft 2⅛in
Height	9ft 5in	9ft 5in	8ft 1⅛in
Chord	5ft 1⅛in	5ft 1⅛in	5ft 1⅛in
Gap	4ft 7⅛in	4ft 4⅛in	4ft 9in
Stagger	18in	18in	Nil
Dihedral	3 deg	3 deg	
Incidence	1 deg 30 min	1 deg 30 min	
Span of Tail	10ft 1in	10ft 1in	10ft 1in
Incidence of tailplane	1 deg 30 min	2 deg 30 min	
Airscrew diameter	8ft 6.34in		8ft 6in
Wing area	254 sq ft	254 sq ft	243 sq ft
Area of each aileron	5.5 sq ft	5.5 sq ft	5.75 sq ft
Total aileron area	22 sq ft	22 sq ft	23 sq ft
Area of tailplane	23 sq ft	23 sq ft	23 sq ft
Area of elevators	11.8 sq ft	11.8 sq ft	11.5 sq ft
Area of fin	3.5 sq ft	3.5 sq ft	3.5 sq ft
Area of rudder	4.5 sq ft	4.5 sq ft	4.5 sq ft
Weights and Performance:			
Weight empty	787 lb	856 lb	880 lb
Military load	260 lb		300 lb
Fuel and oil	178 lb		110 lb
Weight loaded	1,225 lb	1,297 lb	1,290 lb
Max. speed at s.l.	108 m.p.h.	110 m.p.h.	103 m.p.h.
at 6,500ft	106½ m.p.h.	104 m.p.h.	
at 10,000ft	94 m.p.h.	100 m.p.h.	88 m.p.h.
Climb to 5,000ft		5 min 42 sec	9 min
to 6,500ft	8 min		
to 10,000ft	14 min 24 sec	12 min 24 sec	24 min
to 15,000ft	30 min 6 sec	23 min 24 sec	
Service ceiling	17,500ft	18,500ft	
Endurance	3 hr	2 hr	2¾ hr

Allocation.—To the Expeditionary Force, France: 216; to the 14th Wing, Italy: 1; to the Middle East Brigade: 79; to Home Defence units: 73; to Training units: 823.

Distribution of Pups and S.B.3Ds on October 31st, 1918.—With the Expeditionary Force in France: nil; with the 14th Wing in Italy: 1; in transit to Eastern stations: 12; Egypt and Palestine: 46; Mediterranean: 5; in transit to and at Aeroplane Repair Depots: 27; Training units: 98; Home Defence units: 34; various Home Establishment stations: 293; with contractors and at Aircraft Acceptance Parks: 1; In store: Pup, 348, S.B.3D, 18; with the Grand Fleet: Pup, 23, S.B.3D, 37. Total numbers on charge: Pup, 878; S.B.3D, 55.

Tankage.—Pup: Petrol, 19½ gallons, oil, 4½ gallons. S.B.3D: Petrol, 18 gallons.

Costs.—Pup airframe (Le Rhône version), less engine, instruments and gun, £710 18s; Shipboard Pup, less engine, instruments and gun, £770; 80 h.p. Le Rhône engine, £620; 100 h.p. Gnôme Monosoupape, £696.

Armament.—Standard production Pup: One fixed 0.303in Vickers machine-gun mounted centrally on top of the fuselage, synchronized by Sopwith-Kauper interrupter gear to fire forward through the revolving airscrew, and fired by the manual depression of a short horizontal firing lever which projected backwards from the rear of the gun. Various experimental installations of a Lewis machine-gun on the centre section were made but were not successful. Eight Le Prieur rockets could be carried, four on each pair of interplane struts (e.g. as on N.5186). Four 25-lb bombs could be carried in external racks under the fuselage. **Shipboard Pup:** One 0.303in Lewis machine-gun on tripod mounting in front of cockpit. A special aperture was cut in the centre section, and through it the Lewis gun fired forwards and upwards over the airscrew, or could be mounted to fire almost vertically upwards for anti-Zeppelin work. **Beardmore S.B.3D:** One Lewis gun mounted above the centre section to starboard of centre, firing forwards and slightly upwards over the airscrew. (On the prototype S.B.3D a vertically mounted Lewis gun was fitted.)

Service Use.—Pup: Western Front: R.F.C. Sqns. No. 46, 54 and 66; also used by Special Duty Flight; R.N.A.S., "A" Sqn. at Furnes; No. 1 Wing; Naval Sqns. No. 3, 4, 8 and 9. **Home Defence:** R.F.C. Sqns. No. 61 and 112. **Other R.N.A.S. use:** Aircraft carriers *Manxman* (4 Pups), *Furious* (numbers varied; at first 5 Pups, later 14 S.B.3Ds), and *Campania*. Seaplane carrier *Vindex*. Light cruisers *Yarmouth, Caledon, Dublin, Cordelia* and *Cassandra*. Battle cruiser *Repulse*. R.N.A.S. Station, Great Yarmouth. Fighter flight at Walmer. Seaplane Defence Flight at St. Pol. (N.B. The Pups of this unit were replaced by Camels in September, 1917, and the Flight was expanded into the Seaplane Defence Squadron. In January 1918 the unit was named No. 13 Naval Sqn. It is therefore incorrect to state, as has been done, that the Pup was used by No. 13 Naval Sqn.) **Mediterranean:** Naval "C" Sqn., Imbros. **Italy:** One Pup with 14th Wing in 1918. **Training:** Widely used at training aerodromes. Known to have been used at C.F.S. Upavon; School of Special Flying Gosport; London Colney; No. 63 Training Sqn., Dartford; Cranwell; Schools of Aerial Fighting at Turnberry, Marske, Frieston, Sedgeford and East Fortune. S.B.3D: Flown from aircraft carrier *Furious*.

Known Serial Numbers and Notes on Individual Machines.—9496-9497; 9898-9900, built by Sopwith; 9901-9950 built by Beardmore, 9950 modified to become prototype Beardmore S.B.3D; A.626-A.675, built by Standard, A.635 machine "D" of No. 66 Sqn., A.653 had 100 h.p. Gnôme Monosoupape; A.6150-A.6249; A.7301-A.7350, built by Standard; B.1701-B.1850, built by Standard, B.1751 claimed by Germans as shot down in November, 1917, pilot, Lt. Thompson; B.1795, Manfred von Richthofen's 61st victory, pilot Lt. A. F. Bird; B.2151-B.2250, built by Whitehead; B.5251-B.5400; B.5901-B.6150, built by Standard; B.7481-B.7580; C.201-C.550, built by Standard; C.1451-C.1550, built by Whitehead; C.3707-C.3776; D.4011-D.4210, built by Whitehead; N.5180-N.5199; N.5186, with 8 Le Prieur rockets; N.6100-N.6129, Beardmore S.B.3D; N.6190, Pup with rigid skid undercarriage; N.6430-N.6459, built by Beardmore, all with skid undercarriage; N.6454 was flown from *Furious*; N.6460-N.6479, built by Sopwith, standard undercarriage; N.6680-N.6749, Beardmore S.B.3Ds.

Air Power at Sea

H.M.S. THESEUS

In the records of the names of British warships H.M.S. *Theseus* appears three times: first as a third-rate commissioned in 1786, most recently as the light fleet carrier *Theseus* of 13,350 tons launched in 1944. Commissioned in peace, this ship yet has a history of action as one of Britain's principal naval units engaged in the Korean war. In the support of ground formations her aircraft, including squadrons of Fairey Fireflies, flew 3,446 operational sorties and made 4,594 deck landings, maintaining a standard of efficiency in carrier operation seldom equalled. Her reconnaissance aircraft (mainly Fairey Fireflies) covered 23,492,730 square miles.

H.M.S. *Theseus* represents a class of carrier which will, in the near future, operate Gannets, the Royal Navy's latest and most powerful anti-submarine aircraft designed and built by Fairey.

Crown copyright of the badge of H.M.S. Theseus is reserved and reproduction is made by permission of the Admiralty and H.M. Stationery Office.

FAIREY

Powered by an Armstrong Siddeley "Double Mamba"

GANNET

THE FAIREY AVIATION COMPANY LIMITED · HAYES · MIDDLESEX

In the first eighteen months

155,000,000

passenger miles

have been profitably flown by the Comet 1 fleet (de Havilland Ghost jet engines) of the British Overseas Airways Corporation.

On the strength of this successful experience, amounting to 21,000 Comet hours, the British Overseas Airways Corporation have ordered an initial transatlantic fleet of five Comet 3 liners (Rolls-Royce Avon jet engines), capable of flying 97,000 passengers across the North Atlantic in a year (3,000 hours annual utilisation per aircraft).

DE HAVILLAND COMET

War memory: An open-air debriefing at Tangmere in January 1941.

No. 65 (East India) Squadron

By JOHN YOXALL

IT was on the recent occasion of the visit of the Saab J-29s to Waterbeach that *Flight* expressed appreciation of the faultless manner in which the aerobatic team of No. 65 Squadron had carried out its demonstration before the Swedish visitors. So impressed were we that we subsequently sought Air Ministry permission to obtain air-to-air photographs of the squadron and its team in action; the results, together with a short history of the unit, appear in these pages.

Even if in November the clouds do not assume the delicate shapes of those that decorate April skies, there is still a wonderful sense of elation in escaping from the winter murk down below. This ecstatic feeling is heightened when one flies in company with an aerobatic team such as that of 65 Squadron; gravity seems not to exist, inches serve the purpose of yards and split seconds have to take the place of ordinary folks' minutes. Even in the crew room—that home of understatements—65's team is known as the fabulous four.

No. 65 Squadron was born when the Battle of the Somme in July 1916 was in progress. A nucleus was formed in Norwich and the unit completed at Wyton the following month.

The first commanding officers, Capt. E. R. L. Corballis and Capt. Lord G. Wellesley, who took over the squadron later in 1916, were both of the select band of Royal Flying Corps officers who went to France with the British Expeditionary Force in 1914. Capt. Corballis was a flying officer with No. 2 Squadron and Capt. Lord G. Wellesley was with No. 5 Squadron. A variety of aircraft were available for training from *ab initio* to operational standards. These included Maurice Farman Shorthorns, Grahame-White Biplanes, Bristol Scouts, Avro 504s, two-seater Nieuports, back-staggered D.H.5s and Sopwith Pups. (A cynic once remarked that the back stagger on the D.H.5 was not there for any aerodynamic or military reason but simply to fool the enemy as to which way it was going.)

When the unit moved to France in October 1917 it was equipped with Clerget-engined Sopwith Camels. A comparison with the performance of the squadron's present Meteor 8s is interesting. Maximum speed at 10,000ft was 113 m.p.h.; climb to 10,000ft 10.6 min; ceiling 19,000ft; all-up weight 1,453 lb. The cost of each aircraft was less than £2,000!

No. 65 remained on the Continent for the rest of the war as a fighter squadron and it was on November 4th, 1918, just a week before the armistice, that the unit's most successful air combat was fought. On this occasion a formation of more than 40 enemy aircraft was seen over Ghent, Belgium, by a flight of six Camels of No. 65 Squadron. Despite the long odds the Camels immediately attacked and in the resulting dog-fight claimed 15 e/a destroyed. This action is commemorated in the squadron badge by the fifteen swords behind the lion. The lion, by the way, is from the arms of Dunkirk, with which city the squadron was then closely associated.

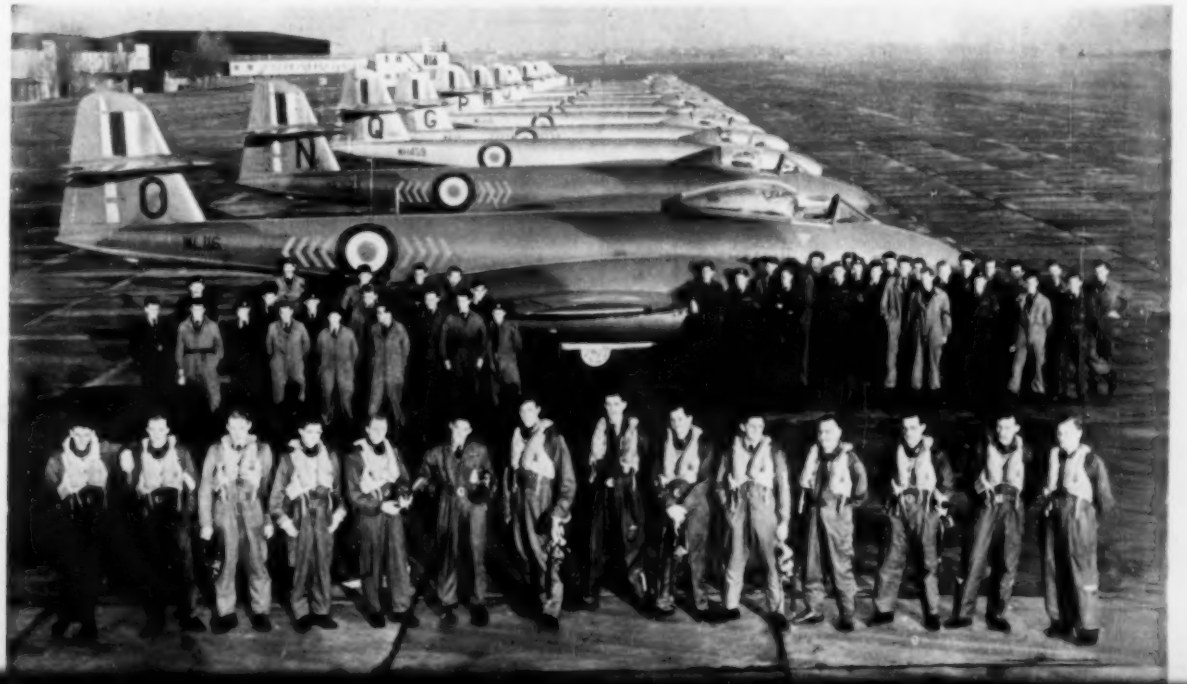
Two years after leaving Britain the squadron returned home and was disbanded at Yatesbury on October 25th, 1919.

When, as the result of political tendencies in Germany, the expansion of the R.A.F. was decided upon, No. 65 Squadron was re-formed at Hornchurch and equipped with Hawker Demon two-seater fighters. Late in 1936 these were replaced by Gloster Gauntlets, and a year later Gloster Gladiators—the last of the biplane fighters—became the squadron equipment. Supermarine Spitfires began to arrive in March 1939 and intensive training with these went on until war broke out on September 3rd.

In common with the rest of Fighter Command, No. 65 Squadron had little or no fighting to do until the evacuation of Dunkirk in May 1940 when, in the unit's first brush with the Luftwaffe, a Ju 88 was shot down over Flushing. Following this introduction a series of patrols were flown over the Channel ports and in the first month's fighting the squadron claimed 19 e/a destroyed and a further 14 probables for the loss of one pilot and three Spitfires.

On July 7th, 1940, eight Spitfires were presented to the unit

Pilots and ground crews of No. 65 Squadron against a background of their smart Meteor 8s. The pilots, left to right, are: P/O. Nash, F/O. Porter, F/L. Pattullo, F/O. Pottage, S/L. Evans (Commanding Officer), F/L. Gill, F/L. Fryer*, F/L. Lethem*, F/O. Bainbridge*, F/L. Lister, D.S.O., D.F.C. Sgt. Howarth, F/O. Goldsmith, P/O. Dunn, Sgt. Coupland. Those marked with an asterisk are members of the aerobatic team.*



No. 65 (East India) Squadron

(Above) In box formation the aerobatic team takes to the air for photography. (Right) "Into line astern—go." The team changes formation during a loop in echelon to starboard. (Below) Squadron take-off in sections of three at six seconds' interval—a wintry scene on the runway at Duxford.

by the East India Fund at a handing-over ceremony at Hornchurch, and it henceforth assumed the title of No. 65 (East India) Squadron.

Then came the Battle of Britain and, before the unit was moved up to Turnhouse for a rest in September, claims were made for the destruction of 32½ enemy aircraft destroyed and many more damaged.

Early in 1941 Fighter Command went over to the offensive and much time was spent in fighter sweeps and escorting formations of Bomber Command aircraft to targets in occupied territory. Later in the year No. 65 Squadron, then equipped with Spitfire 5s, was making low-level attacks, doing shipping reconnaissances and providing cover for Hurricane bombers.

A short spell of training and rest at Debden followed, lasting until February 1942, when operational flying re-started with an air fight over the German ships *Scharnhorst* and *Gneisenau* as they were escaping up the Channel. Strong formations of Fw 190s and Me 109s were encountered but there were no squadron casualties; one Messerschmitt was claimed as destroyed and a further two as probably destroyed.

August 19th, 1942—when the combined operations raid on Dieppe took place—provided another very busy time. On this day alone 79 operational hours were flown but, despite great activity on the ground, very few enemy aircraft were seen. Of those that did put in an appearance two Do 217s were destroyed and a further one of the same breed damaged.

From October 1942 until May 1943 was again a training period, although some operational flying was done. On May 17th the squadron moved south to Fairlop to become a mobile unit of No. 83 (Composite) Group, 2nd T.A.F., and for the rest of the

No. 65 (East India) Squadron

An almost unnatural position—for them! The aerobatic team flying level in echelon to starboard. From the foreground rearward they are F/O. Bainbridge, F/L. Lethem, F/L. Gill and F/L. Fryer.

year operated from various airfields as a self-supporting unit in preparation for the day when it would move over to the Continent. During these months No. 65 was re-equipped twice, first with Spitfire 9s and later with North American Mustang 3s. Operations consisted almost entirely of fighter sweeps and bomber escorts, many of the latter being with the U.S. 8th Air Force.

The squadron's main task on D-Day (June 6th, 1944) was to act as escort to Halifaxes towing Hamilcar gliders, and to paratroop carriers, with Caen, Normandy, as the dropping-zone. This duty was performed without incident but before actually moving over to Normandy on the 25th the squadron had claimed another 10 e/a destroyed and four more probables.

On arrival in France the squadron operated from a landing strip at Martragny and it was from here on July 26th that a further three Me 109s were destroyed, bringing the total score in the second world war to 101½. The passing of the century mark was duly celebrated.

Throughout the summer and early autumn of 1944 No. 65 continued to operate in a tactical rôle, moving forward with the advancing armies through France and into Belgium. Before the unit returned to Britain at the end of September, the last big operation flown from Continental bases was in protection of the glider streams making for Arnhem.

Back in England, the operations for the remainder of 1944 consisted entirely of providing fighter escorts to bombers attacking Germany. Virtually no interference was experienced. Early in 1945, however, when No. 65 was operating from Peterhead in support of Bristol Beaufighters and D.H. Mosquitoes of Coastal Command making shipping strikes off Norway, the Luftwaffe reacted quite strongly, though never strongly enough to prevent the attack being delivered. Just before the end of hostilities the Mustang 3s gave place to Mustang 4s.

The war record of No. 65 shows a total of nearly 11,000 operational sorties flown in something over 16,000 flying hours and the destruction of 119½ enemy aircraft.

COMMANDING OFFICERS

1916-1919

Capt. E. R. L. Corballis ...	11.8.16	Maj. Cunningham	7.7.17
Capt. J. L. Jackson	29.9.16	Maj. H. V. Champion de Crespigny	3.6.18
Maj. Lord G. Wellesley ...	7.10.16		
Maj. Nethersole	22.2.17		

1934-1950

S/L. F. O. Soden	1.8.34	S/L. J. Storrar, D.F.C. ...	22.1.43
S/L. C. F. H. Grace ...	1.2.37	S/L. R. Grant, D.F.C. and Bar, D.F.M.	16.11.43
S/L. D. Cooke	13.10.37		
S/L. H. C. Sawyer	8.7.40	S/L. G. Johnston, D.F.C. ...	7.1.44
S/L. A. L. Holland	13.7.40	S/L. D. Westerra, D.F.C. ...	24.3.44
S/L. G. A. W. Saunders ...	30.10.40	S/L. D. P. Lamb, D.F.C. ...	10.7.44
S/L. J. W. Villa, D.F.C. and Bar	2.8.41	S/L. Buna-Robinson, D.F.C.	10.9.44
		S/L. I. Strachan	6.1.45
S/L. M. Czernie, D.F.C. ...	17.12.41	S/L. T. Stewart	29.1.45
S/L. H. T. Gilbert	21.12.41	S/L. J. W. Foster, D.F.C. ...	26.4.45
S/L. A. C. Bartley, D.F.C.	2.5.42	S/L. C. Haw, D.F.C., D.F.M.	3.9.46
S/L. D. A. P. McMullen, D.F.C. and two Bars ...	2.7.42	S/L. W. A. Toyne, D.F.C. ...	3.10.48
		S/L. W. T. Russell	16.5.49
Comdt. R. G. O. J. Mouchotte, D.F.C. (Free French Air Force) ...	1.9.42	S/L. D. A. Taylor, D.F.C. ...	15.5.51
		S/L. V. R. L. Evans	15.11.52

Since the war the squadron has undergone a number of changes. First it was a fighter squadron with Spitfire 16s, later re-equipping with D.H. Hornets. In 1949 the squadron rôle changed to that of daylight low-level intruders and later, on receiving Gloster Meteors to replace the Hornets, it reverted to day fighter duties once more, with the modern implication of high-level interception.

An outstanding post-war trip was a goodwill visit made to Sweden in 1948. It was, therefore, appropriate that No. 65's aerobatic team, nominated as representatives of No. 11 Group, should put on their show for the Swedes during the latter's visit to the Royal Air Force station at Waterbeach this year.

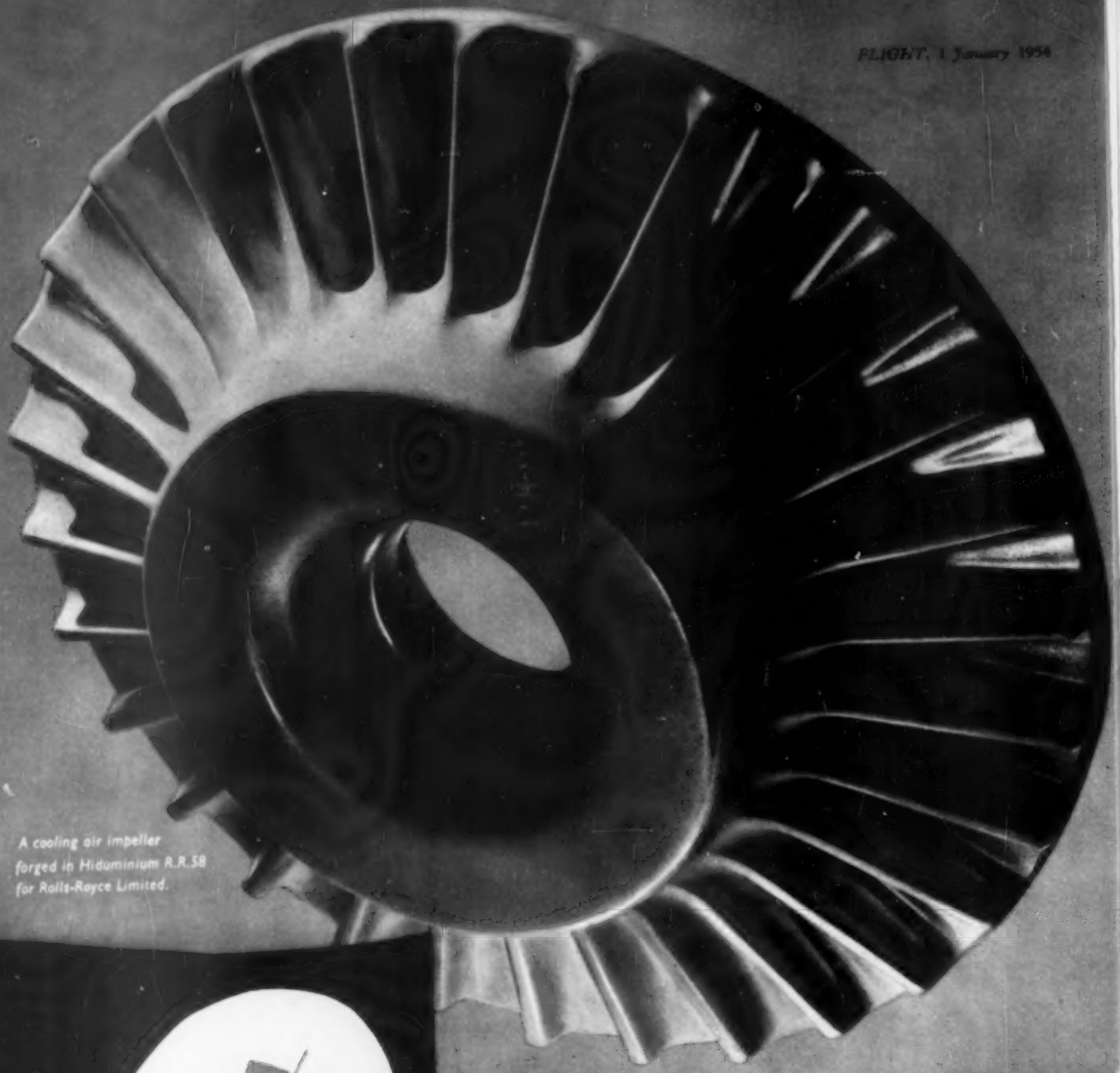
Portrait of the C.O's Meteor 8 with the winter clouds of East Anglia to enhance the setting.

The Alvis Leonides — 550 b.h.p. 9-cylinder air-cooled radial engine. Weight complete 796 lb. Power/weight ratio 1·45 lb. (0·657 kg.) per b.h.p. Overall diameter 41·5 in (105 cm.) In quantity production for the Royal Navy, the Royal Air Force and Commercial Operators.

ALVIS

LEONIDES

ALVIS LIMITED · COVENTRY · ENGLAND



A cooling air impeller forged in Hiduminium R.R.58 for Rolls-Royce Limited.

Whenever British Aircraft take the air

..... HIGH DUTY ALLOYS

fly with them

AIRCRAFT INTELLIGENCE

AWAITING FLIGHT TESTING in France is this Payen P.49 delta. Taxying trials have been made at Melun Villaroche by M. Oshenbien.

Great Britain

Short Seamew. It is reported in America that the weapons to be carried by this light anti-submarine aircraft probably include "the same variety of guided torpedoes that the Fairey Gannet will carry." The Seamew, incidentally, represents a class of aircraft not developed in the U.S.A.

France

S.E.5000 Baroudeur. It is learned that this trolley-launched, skid-landing, Atar-powered fighter/attack machine has been flown with its jettisonable take-off trolley still in place.

S.O.4050 Vautour. The second prototype of this twin-jet multi-purpose aircraft has flown. It is laid out as a single-seater with heavy forward-firing armament (two large gun ports are visible), and has a full length dorsal spine. The third prototype —a bomber—should be completed in a few months. The first small production series of Vautours will include three versions—ground-support, bomber and all-weather fighter. Initial deliveries will begin in 1954 and large-scale output will follow. The first Vautour has SNECMA Atar 101-C turbojets of 6,160 lb thrust, but later machines are having Atar 101-Ds and Es, of 6,600 lb and 7,260 lb respectively. One example will have Armstrong Siddeley Sapphires, and a design study for Rolls-Royce Avons is in hand. Reheat and jet deviation will be tried.

United States

U.S.A.F. Strength. "Air power seems to be holding its own in the tussle for money," writes a correspondent in America. The target strength of the U.S.A.F., recently changed for the fourth time in less than twelve months, is now 137 wings, and the corresponding target date is June 30th, 1957. [Under President Truman's budget for 1954 the original planned strength for January 1956 was 143 wings; this was subsequently reduced to 120 wings by the Eisenhower administration, but after further consideration the target was changed again—to 127 wings.] The estimated composition of the 1957 U.S.A.F. will be as follows: Strategic Air Command, 55 wings; Air Defence Command, 38 wings; Tactical Air Command, 29 wings; Air Transport Command, 15 wings.

Boeing B-52. It is now known that the production B-52A will differ very considerably both in equipment and in exterior features from the prototype XB-52 and YB-52. The principal change is a switch to the British type of cockpit in which two pilots sit side-by-side; this will be in the extreme nose, covered by a squat, airliner-type canopy. The bomb-door geometry is unlike that of the prototypes, and the doors extend further up the sides of the fuselage; the fuselage itself is also longer and the B-52A appears to be about 160ft overall (compared with 153ft). Particularly interesting is the tail turret: whereas that of the prototypes formed a simple pointed rear end, the production assembly is a complex arrangement with a powered weapon-holder at the bottom surmounted by a radar scanner, with a gunner's position further forward under the root of the rudder.

Republic F-84F. The transonic, Sapphire-powered Thunderstreak is still being built with a nose intake, but the later variants with root intakes are already on the line, with noses housing various combinations of guns or cameras. Trouble with the heavily swept, high aspect-ratio horizontal tail has led Republic to abandon the original combination of elevator and variable-incidence tailplane in favour of a single, irreversible powered surface, as on the F-100. A point worth noting is that titanium nuts, now widely used in the hot parts of the airframe, save 150 lb per aircraft; it has been estimated that, had the F-84F been designed for titanium from the start, the figure could be from 700 to 1,000 lb. This figure underlines the amount of stainless steel that goes into American fighters.

Douglas DC-7. According to *Aviation Week*, the DC-7 received its C.A.A. certification on Friday, November 13th, but to avoid "hanging a jinx" on the aircraft the document was dated November 12th.

Douglas A4D. This transonic, carrier-based attack aircraft has now been inspected in mock-up form by many U.S. Navy pilots, who express delight at the simple cockpit. The power unit is an American-built Sapphire, of the same type as fitted to the North American FJ-3 Fury.

DISCUSSING PRODUCTION

The Southampton Conference Reviews the Subject from Contrasting Angles

THE second annual conference on problems of aircraft production—organized by the Institution of Production Engineers, Southern Section—was held at the University of Southampton on December 18th and 19th, by permission of the Vice-Chancellor. It was a most heartening occasion, excellently supported by over 200 delegates representing all the interested firms, societies and Government departments.

The Conference opened with a luncheon, at which Mr. F. C. Cooke, M.I.Prod.E., president of the Southern Section of the Institution, took the chair. Delegates were welcomed by Alderman Mrs. V. F. King, B.A., J.P., Mayor of Southampton, and were addressed by The Lord Hawke, a Lord-in-Waiting in Her Majesty's Household. Lord Hawke described himself as being an "underlord" responsible to the Minister of Transport and Civil Aviation, the Rt. Hon. A. T. Lennox-Boyd, M.P., who was prevented by a parliamentary debate from being present. The Minister's parliamentary secretary, Mr. J. D. Profumo, was also unable to attend the conference; he had undergone an emergency operation, but was reported to be progressing well.

Whoever selected the speakers knew his job. The first paper was by Mr. D. Keith-Lucas, B.A., M.I.Mech.E., F.R.Ae.S., chief designer of Short Brothers and Harland, Ltd. His subject was "The Trend of Design," with particular reference to the structure of high-speed aircraft. A paper by Mr. G. H. Dowty, M.I.Mech.E., F.R.Ae.S., F.I.A.S., chairman and managing director of Dowty Equipment, Ltd., followed; the title of this paper was "Production Problems Arising from the Trend of Design—from the viewpoint of an equipment manufacturer." In the absence of Mr. Dowty, who was indisposed, the paper was read—at very short notice—by Sir Roy Fedden.

Dealing with the same subject from the point of view of a manufacturer of high-speed airframes, Mr. S. P. Woodley, M.B.E., superintendent, Supermarine Division, Vickers Armstrongs, Ltd., presented a paper which is summarized below.

The two final papers were concerned with "User Problems affecting the Industry," that by Air Marshal Sir R. O. Jones, K.B.E., C.B., A.F.C., controller of engineering and equipment, Air Ministry, offering the view of the Services, and that by Mr. B. S. Shenstone, M.A.Sc., F.R.Ae.S., A.F.I.A.S., chief engineer of B.E.A., putting the case for the airline operator. His paper is summarized opposite. The conference was summed-up by Sir Frederick Handley Page, whose remarks, together with those of the remaining lecturers, will be published in an early issue.

MR. WOODLEY'S PAPER

THE lecturer felt that a distinct transition stage in design had now been reached, in which "tin-bashing" and assembly work was giving way to an increased emphasis on machining. In fighters, higher speeds and greater stresses were causing the gradual disappearance of the conventional wing spar, the load now being spread over the thick skin, which might be integrally stiffened. Concurrently, the internal wing structure was becoming so massive that most of it was likewise machined from solid, or from forgings.

A similar trend was evident in fuselages; modern fighter frames were forgings, machined all over, while integrally stiffened fuselage skins were also appearing.

Mr. Woodley showed a number of photographs of machined forgings, the machining being necessary to ensure compliance with rigid weight-control limits, which were too fine to permit the use of the part as-forged. It was considered that, as a result of the use of such parts, the trend towards ever-increasing complexity in structure would be halted, or even reversed, with welcome reductions in assembly-time and, indeed, in the man-hours required to build the whole aircraft.

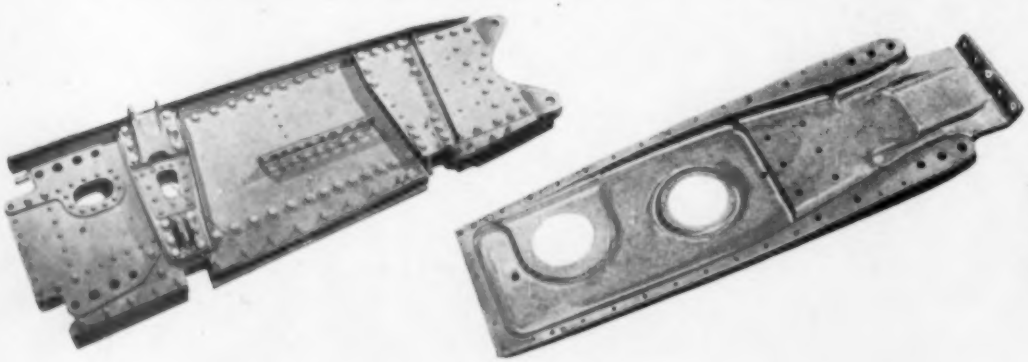
There should also be a reduction in tooling costs and, if the development of milling machines proceeded on "the right lines," it would be possible to machine complicated parts from simple templates or line-drawings upon metal—or even from numerical information fed into the machine. Mr. Woodley returned to this theme later, with special reference to copy-machining; he underlined the vast field of research which lay open in the field of machining according to the instructions of a magnetic tape, punched card, or a computor which determined cutter position from drawing ordinates. He described the American Variax machine which, although at present designed for control by steel templates and electronic tracers, was eventually to dispense with templates entirely, their place being taken by a magnetic tape. The logical outcome was a completely automatic factory.

Production development was a subject which merited, but did not receive, considerable attention, both from the point of view of man-power and money. It should be the sole concern of a special department in the factory, free to undertake and solve problems as they arose, and able to look far ahead unworried by day-to-day difficulties. Another factor, about which Mr. Woodley made some pertinent comments, was the lack of any really large forging press in this country. Whereas the United States had laid down an extensive programme of presses equalling, or surpassing, in size those captured from Germany in 1945, we had no such programme either under way or visualized. With such presses it was possible to produce really close-limit forgings, as well as forged parts far larger than was at present possible.

As for integrally stiffened skins, this country was not following the American method of machining stiffeners parallel to each other, but was employing a variety of reliefs, stiffeners and rebates. What was wanted was a large machine fitted with both vertical and horizontal milling heads and capable of machining in three dimensions; Mr. Woodley knew of no single machine capable of machining skins with converging integral stiffeners, combined with a tapering basic skin and pockets or rebates relieving the less highly stressed parts.

The Supermarine company had undertaken research into the use of conventional routers for skin milling, and Mr. Woodley illustrated some ingenious developments, some involving a pair of radial-arm routers mounted opposite each other across a roller conveyor platform. With these, the work was held in a vacuum chuck and the radial arm supported so that it machined in a perfectly flat plane. Copy machining could be done by adding a template, tracer, and hydraulic servo system operating the cutter *via* hydraulic jacks. A whole bank of such machines might be put into use at a fraction of the cost of a large skin-miller.

Another Supermarine practice was the manufacture of wooden models of machined fittings, which had innumerable uses in the shops, jig and tool offices and design office. Their use aroused much favourable comment from delegates.



On the extreme left is a portion of fabricated wing rib showing the numerous structural members, joints and rivets, and giving an idea of the tooling required. Next to it is a portion of a Supermarine rib machined from solid.

The lecturer went on to discuss the use of modern airframe materials such as 100-ton steel and titanium; some of the related problems were the need for a fine finish on notch-sensitive components, the difficulty in finding suitable cutting tools and fluids, the need for powered sheet-rolls of much greater capacity than any at present in use, and—of course—the fact that titanium, either pure or alloyed, was almost unobtainable.

Heat treatment brought its own problems. It was usual to machine a large component in the annealed state; the locked-in stresses in some billets precluded machining in the hardened condition, and with every cut the material seemed alive, and moved to such an extent that subsequent cuts would not clean up. It was also essential to evolve a heating-and-quenching sequence with the minimum of distortion. A typical component in which such problems were severe was the wing-spar fretwork (illustrated here) measuring 11ft by 5ft and machined from a solid slab of light alloy weighing 850 lb initially and 105 lb machined.

Integral construction increased inspection difficulties and it was essential to take any short cuts that offered themselves in this regard. An optical comparator could be of great assistance, as could simple and adjustable inspection fixtures, set by reference to a master component and used by unskilled labour.

Other problems were introduced by the high notch-sensitivity of high-strength light alloys and novel methods were being used to remove surface imperfections. One such method was the barrelling technique, in which a batch of components was rotated in a drum filled with limestone chips, water and a foaming agent. All machine marks were removed by this treatment and a finish was obtained consistently better than 14 micro-inches.

The Discussion on Mr. Woodley's Paper.—In the ensuing discussion (which was not half as long as most of the delegates would have liked) further points were brought to light. Replying to Mr. T. Gilbertson (Folland), the lecturer said that he had not mentioned the use of plastics because insufficient experience had been obtained in the use of such materials. Regarding the "production development" department, it was good practice to assign one problem to each man who would be left to work it out to the end. It was essential not to have personnel in any sense hidebound by conviction or tradition; in this work the College of Aeronautics at Cranfield were doing excellent work.

From that college came Prof. J. V. Connolly, and he said he found Mr. Woodley's paper very refreshing. It was, he said, unfortunate that long-term production research was getting such trivial attention. And, until recently, it was impossible to get production engineers from the ranks of fully trained engineers, for the latter had shown little interest in the subject. On the subject of tapered skins (mentioned by Mr. Woodley) Prof. Connolly recalled that up to 25,000 tons per year was used in the American industry and that it was also bought from stock in France and was, in fact, used on the Mystère fighter.

Sir Roy Fedden then rose and announced that, as a result of a study made during the past six to eight months, he was able to state that the aircraft industry was not giving long-term production methods enough attention, even in comparison with other industries. Production engineering was regarded in a completely wrong light in this country, and it carried little prestige and took far too few engineers to the boardroom. In America and Germany the position was healthier and it was possible to get a degree in production engineering in those countries. As for the availability of tapered sheet in France, Sir Roy had kept the British industry informed, but there had been little interest.

From Western Manufacturing (Reading) came Mr. R. W. Seymour-Lee, who inquired whether it was true to say that airborne equipment took as long to develop and build as did the airframe. He felt that it was essential to standardize on equipment wherever possible—excepting such individual items as autopilots, powered controls and landing gear, and even these major installations should use standard components. On the other hand it would be very unwise to elect a governing body to specify the use of such standard equipment.

Describing work done at Cranfield, Mr. J. Cherry, a senior lecturer at the College of Aeronautics, gave quantitative results for the machining of S.11 steel with a high-speed tool.

Mr. W. A. Sales, O.B.E. (Ministry of Suppy) stated that vapour blasting was now giving about six times the grit velocity that Mr. Woodley had quoted and offered more promise than the lecturer had suggested. Shot peening was another aspect of the process, useful in combating fatigue. He recalled that a Swiss firm had delivered, 18 months from the date of ordering, a three-dimensional machining tool for Mystère production.

Replying to other questions, Mr. Woodley said that, in his view, one large forging press would not be able to provide sufficient capacity for the British industry; others would certainly be needed. On the other hand, he was not prepared to suggest who should finance the construction of such costly machines, or who would allocate their use among firms. On the question of scrap from integrally-made parts, this was much less—in terms of parts—than was at present the case with fabricated parts. In any case, once properly established in production, it was difficult to go wrong, and scrap from an automatically controlled machine should be negligible. (Mr. Woodley had earlier stated that the finish obtained with automatic control was better than could be obtained with the most skilled operative working manually, and that electronic control gave better finish than hydraulic control.) One somewhat pointed question directed at Mr. Woodley was "If you had to start from a bare floor and make ten sets of ribs, how would you build them?" The lecturer replied that "tin-bashing" was the answer for such a requirement, but that normal production for a fighter would be better using an integral method and that, in principle, expensive and large machine tools were not required. Electronic control was most promising and should be fully established at Supermarines within two years at the outside.

Another of Mr. Woodley's illustrations was of this fretwork-machined wing spar. This unit, clearly intended for a swept-wing aircraft of fighter size, is more advanced in conception than the similar grid used in the wing of the latest Sabres.

Saying that lofting was a problem in modern aircraft, Mr. A. Vines (Fairey) inquired whether a modern fighter could genuinely be built to the drawings. Faireys had, at least, found that three aircraft could be built alike and that they would then fly alike. Mr. Woodley felt that "one would have to be very brave to try to make an aircraft to drawings"; it was advantageous to enlarge contours to ten times full size—or thereabouts—and then reduce the resulting curve photographically. It might be better still if the curve were generated mathematically.

MR. SHENSTONE'S PAPER

THROUGHOUT this paper the author repeatedly stressed the unique requirements of airline operators with regard to overall life, interchangeability, and the fact that airline operation was a strictly competitive *business* in which it was most important not to throw away good flying hours because of what *might* happen.

Fatigue was intimately involved, and it was essential that the design should be such that, when fatigue started, it could be detected and cured without "fantastic cost." A suggestion was the use of a multi-cellular structure, in which failure of one part could not reduce the ultimate load factor by more than about 25 per cent.

On interchangeability, Mr. Shenstone said: "With lives of the order indicated, it will be realized that items have to be taken off and replaced literally hundreds of times and that a mere shop test that all fins will fit on every fuselage is only the beginning. The point is a practical one because in a fleet of, say, thirty aircraft, as time goes on every detachable item will eventually be fitted to every aircraft." This, he said, ruled out "reaming to fit," or the cutting-back of badly matched holes.

B.E.A. had never been brought into jigging problems; it might be advantageous to jig the aircraft during manufacture with an eye on interchangeability, and the operator should certainly be called in to advise on this point. On consistency—the degree to which a number of allegedly identical components gave identical performance throughout their lives—the author pointed out that, although many components had laid-down lives, the user could never be sure that this life would be obtained. Ailerons had been troublesome, and B.E.A. were unable to change these surfaces on one type of aircraft without making test-flights and numerous adjustments. It was the lecturer's experience that there was better consistency among small items of American manufacture than among corresponding British products.

A frequent source of trouble was the bad design, or short life,

(*Continued at foot of page 24*)

SUPERSONIC SHAPES

Lockheed's Chief Engineer Questions the Delta Configuration

THE subject (or title) of this lecture is one of wide interest, and the views of the Lockheed Aircraft Corporation as expressed by its chief engineer are well worthy of study. For this reason we publish the accompanying summary of a recent S.A.E. (Los Angeles) lecture. Some of the facts, arguments, figures and deductions may come strangely to British readers, and those concerned with delta-wing aircraft in this country may here and there disagree—as, no doubt, will Convair engineers. The marked difference between delta-wing considerations for high subsonic and supersonic flight should not be overlooked.

AT the S.A.E. National Aeronautical Meeting in Los Angeles, California, Mr. Clarence L. Johnson (chief engineer of the Lockheed Aircraft Corporation) delivered a noteworthy lecture on the subject of aircraft configurations for flight at between Mach 0 and 2. A summary appears below.

Saying in his introduction that he intended to touch on a few factors concerning power plants, but to concentrate chiefly on aircraft configuration, the lecturer remarked that he looked with some disfavour on the amount of publicity which had been given to the delta wing form—on which, he claimed, there was little flight experience and in some cases only very limited wind tunnel data. The delta had become fashionable, but, he said, "styles are bad things in engineering."

On the other hand, the afterburner, viewed by many as a "contraption of the devil," had come to stay. At a Mach number of 2 the afterburning engine developed 320 per cent of its static thrust, while the non-afterburning unit developed only 180 per cent. It was therefore apparent that, for a given thrust at Mach 2.0, an engine with afterburner was lighter, more compact, and easier to install than another, without afterburner, large enough to produce the same thrust at the same speed. A comparison of weight alone showed a 25 per cent advantage to the afterburning engine. Mr. Johnson ruled out rocket power because of its fuel consumption and short endurance, and plain ramjet power because of its limited speed-range.

With the help of a diagram (Fig. 1), he showed that engine thrust had increased by 300 per cent since 1945, while airframe drag at Mach 2 had been reduced by 50 per cent. These advances had made possible the design of practical supersonic aircraft. In addition, he stated that high-speed turbojet aircraft attained optimum speed performance at isotropic altitude, i.e., 35,000-40,000ft. Above this height, the jet engine was no longer favoured by decreasing air temperature, and its efficiency fell off rapidly.

Mr. Johnson now turned his attention to aircraft configurations, dealing first with the delta wing. Very few delta aircraft had so far reached high speed and, in fact, few attained the speeds of Service aircraft. He saw the advantages of the delta wing primarily in its structural features. The tailless delta was committed to flight at low angles of attack because of high drag penalties at high lift settings. Trailing-edge elevators decreased lift considerably. This, together with high leading-edge sweep, produced low maximum lift coefficients—the chief disadvantage of the delta. Even the structural advantages of the delta wing could be found equally in a rectangular wing with an aspect ratio of 2 or 3.

Delta aircraft made up for their lack of horizontal tail surface by requiring a very large fin and rudder area. In fact, the speaker demonstrated by a table [opposite] that the tailless delta often had the same total surface area as an aircraft of conventional configuration. He said that the low wing-loading required for a delta in order to obtain reasonable take-off and landing distances resulted in fact in greater surface area per pound of gross weight than with conventional types. For supersonic aircraft, this was a most undesirable trend. The provision, however, of a normal tail for a delta wing allowed higher wing loadings and improved overall performance.

The lecturer claimed that supersonic flight required wing thicknesses so low that the advantages previously credited to the delta wing disappeared. Since it was impossible to reduce the cross-section of the engine, military equipment, air ducts or pilot by a choice of wing plan-form, the delta wing, with its ample stowage space, in the end showed no advantage over the normal wing. While fuselage size had to be essentially the same for straight or delta-wing configurations, the delta, with its large fin, merely produced greater aerodynamic drag. While low wing-loading sounded good—"pounds per square foot falling off the slide rule"—maximum lift required very high angles of attack. Mr. Johnson maintained that the delta had limited pitch control and a low usable maximum lift because of limitations in angle of attack during landing and take-off.

The speaker next dealt with a 1947 Lockheed design-study for a twin-fin delta fighter. Construction had actually started when the project was abandoned because it "showed so many aerodynamic problems" during extensive wind tunnel testing. One of the major difficulties was stability at high angles of attack, the most dangerous being the reversal of directional stability prior to the wing stall. The delta became directionally dynamically unstable immediately above the stall, whereas the straight-wing aircraft became directionally neutrally stable considerably above the stall. Even the use of twin fins did not correct this fault in the delta.

The delta's loss of lift at high angles of attack made landing approaches at high power settings necessary, and great difficulty was experienced in trimming the aircraft for such angles of attack, without spoiling its stability. L/D ratio, gliding at a speed 40 per cent above the stall, with 3.7 : 1 for the delta and nearly twice this value for the F-80. The lack of round-out obtainable for landing required long oleo-leg travel which, on the Lockheed design, turned out to be 25in. While the basic wing structure was quite light, it became heavy after stressing for high suction forces on the upper surface encountered during high-g pull-outs at low altitude, and because of the large number of stressed access-panels which had to be included in the wing surface. This delta wing finally became several hundred pounds heavier than an equivalent swept wing for a conventional configuration. The Lockheed design was eventually discarded because of the high drag of the wing over the transonic speed range.

The swept wing was found to have good characteristics at high subsonic and transonic speeds. It also had disadvantages, such as high structure weight, aero-elastic problems, low maximum lift, and pitch instability near the stall. For supersonic speeds the swept wing was, Mr. Johnson considered, inferior to straight or delta layouts.

A straight wing was defined as one with zero sweep between 25 and 70 per cent chord; it would probably have to be tapered for structural reasons. If a low aspect-ratio was required, it was quite possible to design a straight wing with a thickness/chord ratio equal to that of the delta. The major problems would lie in aero-elasticity and flutter, but even these were not insoluble. The straight wing, because it could provide lift coefficients better than those of the delta, even when extremely thin, gave better take-off and landing characteristics than the delta. Conversely,

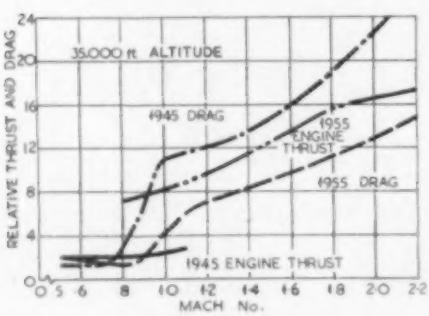


Fig. 1. (Left) Comparison of thrust and drag against Mach number between fighter aircraft 1945 and 1955.

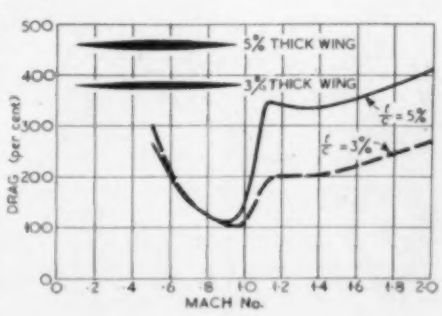


Fig. 2 (Right) Effect of thickness on the drag of a straight wing with no leading-edge devices and with a level-flight lift coefficient.

it allowed higher wing loadings for a given take-off or landing performance.

There were many ways of comparing aircraft in the theoretical design stage, but, Mr. Johnson said, two factors would always have to be taken into account. These were "real estate" or runway length available, and the "mission"; two aircraft designed to one specification would have to be capable of carrying the same equipment or payload. It was in relation to runway lengths that the low maximum lift of the delta became a serious disadvantage.

Drag Factors in Configurations.—Mr. Johnson now dealt with the drag factors involved in various configurations. He said that doubling the Mach number increased the drag of the aircraft to 520 per cent of the value at 0.8 Mach. Wave drag became extremely important; and trim drag, due to the pitching moments of the wing and tail, became noticeable. Furthermore, extremely thin wings assumed major importance. This could be shown by a diagram [Fig. 2] and by the fact that at Mach 1.5 a wing 3 per cent thick had only 63 per cent of the drag of a 5 per cent wing of the same planform. For such thin wings there was the problem of leading-edge flow separation (when no leading-edge droop was employed); it was at first thought, during wind tunnel tests, that this separation would disappear with increased Reynolds number, but it had not done so. The low-aspect-ratio wing caused high drag over an important range of speeds, particularly on approach and take-off; there was nothing good, aerodynamically, about low aspect-ratio, but it was required in high-speed aircraft in order to obtain the low thickness ratios which would be otherwise impossible. The delta suffered considerably in maximum L/D ratio because of the upturned trailing-edge flap required for longitudinal control. A delta wing thus trimmed had a ratio only 63 per cent of its ratio without trim, comparing unfavourably with a straight wing of similar aspect and T/C ratios.

Lift Considerations.—The delta achieved its maximum lift at an angle of attack which was unusable with practical ground angles and landing-gear lengths. It was possible to improve this situation, however, by fitting a conventional horizontal tail surface and employing normal high-lift flaps. It was far easier, however, to obtain maximum lift from a straight wing, which was far more amenable to the use of high-lift devices and the shorter aerodynamic chord of which reduced the tail load required for trimming. If the maximum usable lift of the straight wing was taken as 100 per cent, the tailed delta developed 70 per cent, and the pure delta only 48 per cent. When these values were considered in the design of several aircraft for comparable take-off and landing performances, it was obvious which type had the advantage. Even on longer runways the straight wing proved superior to the delta.

COMPARISON OF SURFACE AREAS

Aircraft	Over-all length (ft)	Wing area		Horizontal tail area		Vertical tail area		Total area of wing and empennage	
		sq ft	% of wing area	sq ft	% of wing area	sq ft	% of wing area	sq ft	% of wing area
F-80A	34.5	237.6	100	43.5	18.3	22.5	9.5	303.6	127.8
F-86	37.54	287.9	100	33.9	11.8	33.4	11.6	355.3	123.4
XF-92	42.5	425	100	—	—	76.1	17.9	501.1	117.9
F-94C	40.08	232.8	100	60.3	25.9	28.0	12.02	321.1	138.0
F7U-3	43.17	535.3	100	—	—	147.4	27.5	682.7	127.5
Avro 698	109	4230	100	—	—	294	6.9	4524.0	107.0
Avro 707A	34.17	426.5	100	—	—	29.9	7.0	456.4	107.0
Gloster Javelin ...	57.0	905	100	79	8.7	61	6.7	1045.0	115.5
Boulton Paul P5-120	29.63								
Boulton Paul P-111	26.1	291.0	100	—	—	33.5	11.5	324.5	111.5

Stability and Control.—On the subject of stability and control, Mr. Johnson said that stability problems would always arise on an aircraft with low aspect-ratio, sharply swept wings, and that yaw and roll dampers would probably become standard equipment. Some aircraft would suffer from rudder reversal or Dutch roll at high angles of attack and low speeds. Trim changes at transonic speeds would, however, automatically disappear with improved aerodynamic forms and thinner wings. Any aircraft, he said, which could exceed Mach 1 in level flight would also have greatly improved flight characteristics. With thin wings, however, some degree of transonic buffeting might have to be accepted.

Increasing size of fuselage, both in length and cross-sectional area, would, despite better fineness ratio, have an increasing effect on airflow over the wing and tail at high angles of attack. Claims had been made that centre-of-pressure travel was less on a delta than on a straight wing: this was true in percentage of chord travel, but not in actual linear distance which was the same for both wings. The low c.g. travel limits of the delta made c.p. travel far more critical for this plan form.

Altogether, claimed Mr. Johnson, the Lockheed Corporation had found that the straight wing, in conjunction with a properly designed tail, had stability and control characteristics superior to those of any other form of wing. Whereas most present-day high subsonic bombers and transports used swept, relatively thick wings—for wing fuel carriage and optimum performance up to Mach 1—supersonic aircraft of this size would need a different wing design. For a given mission and with a given power plant, the subsonic delta wing with all its problems appeared inferior to the swept wing in that speed range.

The lecturer concluded by saying that with the solution of the aero-elastic problems associated with the unswept, very thin wing, this planform appeared to have substantial advantages when evaluated on a strictly comparative basis and with a view to high supersonic speeds.

SAAB 91C SAFIR (continued from page 3)

noticeable trim-change. The flaps came up in like manner. One then immediately had to coarsen pitch to prevent overspeeding.

Since I could see the ground only directly below, I was committed to a timed circuit and therefore started a Rate 1 turn to port and levelled off at a few hundred feet. Once settled as nearly as possible on a reciprocal heading according to the compass, I had my first and only opportunity of sampling the feel of the aircraft straight and level. This was pleasantly light and positive and suggested immediately the direct, sensitive feel of a thoroughbred. The speed built up quickly and smoothly, still without any apparent trim change. It was rather noisy in the cabin, but this Saab are to rectify with soundproofing when the new furnishings are installed.

Out of sight of the airfield, and indeed of any recognizable ground feature, I began another turn to port after a due interval. The magnetic compass no longer indicated to within less than 30 or 40 deg and we called the tower to say we hoped we were approaching land.

I spotted first the "pundit" and aimed slightly to starboard of it. Then, at something less than 900 yd, the runway lights came into view to starboard and, after some very fast work with power and flaps by Bertil Andersson, we turned sharply on to the runway. Once lined up, the landing was simple, positive and quite uncomplicated. After touch-down the nosewheel came onto the runway of its own accord, and after a short distance we turned off at the first intersection—not without a considerable sensation of relief. It was out of the question to tempt the circuit further in such visibility and in the now-increasing gloom.

In such circumstances it was clearly impossible to carry out a full air test, but even in so short and restricted an experience the Safir proved itself most pleasant to handle and inspired considerable confidence. I should like very much to have tried some aerobatics, since the aircraft is at present cleared for 4g in England and was built for 6g. It is rarely that one finds a four-seater offering such equipment and comfort, with 190 h.p. and a tricycle undercarriage, and yet so compact, so tough and fully aerobatic. The 91C will cruise comfortably at about 150 m.p.h. and, if fitted with full blind-flying panel and A.D.F., should prove a first-rate executive aircraft. Almost every feature of the design shows the care and ingenuity which have been exercised in meeting every likely demand of a private owner. Further refinements which Saab intend to incorporate include manual control for engine cooling-air outlets (these are at present pre-set on the ground) and a number of optional instruments.

Except for the instrument layout—which, it was pointed out, is subject to customer's requirements—I had difficulty in finding anything which appeared to require correction or alteration. The 91C seems admirably suited for any task which it is capable of performing—for instance, club, executive, ambulance and light freight flying.

I was, of course, unable to try the aircraft at full load with four occupants, but the 190 h.p. engine now fitted should overcome the slight sluggishness that was apparent in the Gipsy-engined 91A under these conditions. Luggage space would, however, prove rather limited with four up; the one small compartment behind the rear passenger seats would, we fancy, hold little more than overnight effects for four people.

But the 91C Safir is a most pleasant aeroplane. With its good performance and equipment it must equal the American standards for such aircraft and even surpass them on many counts. As a personal machine for combined business and pleasure it can surely have no equal in its class in Europe. C.M.L.

CIVIL AVIATION

ANOTHER BRITANNIA : Flight trials with G-ALRX, the second prototype Britannia, began at Filton on December 23rd. It is pictured landing after a maiden flight of 1 hour. Recent announcements concerning Britannias are summarized in the adjacent paragraph.

BRITANNIA PROGRESS

DEVELOPMENT of the Bristol Britannia during 1953 was brought to a satisfying climax on December 23rd by the first flight of the second prototype. Manned by A. J. ("Bill") Pegg and a test-crew of six, it made a local flight lasting one hour from Filton. With delivery of the first four production Britannias expected towards the end of 1954, the introduction of this great turboprop airliner on B.O.A.C.'s routes grows steadily nearer. There is naturally a growing enthusiasm for the prospect of operating Britannias among the Corporation's employees, and, to meet the demand for news of progress, the *B.O.A.C. Review* recently published an informative summary of the Britannia programme. Several extracts from this article merit wider circulation and are accordingly summarized below.

"Overhanging the whole problem of initial production and delivery and setting the pace for manufacture," observes the *Review*, "is the question of the Certificate of Airworthiness." The intention is to obtained the C. of A. by June 1955, although many people closely connected with the work are hoping that the date may be sooner—possibly as early as December 1954. Development flying and crew training will go ahead during the early months of 1955, and by the summer of next year nine production Britannias should be ready for immediate service.

Subsequent Britannias will appear at the rate of one a month for four months. By the time the last part of B.O.A.C.'s contract —a batch of 10 "stretched" Mk. 300s—is under way the rate will have been doubled. Much of the test flying on the first prototype, G-ALBO, has been conducted by W/C. W. Gibb, Bristol's assistant chief test pilot, who told *B.O.A.C. Review* that this machine was now doing long spells of night flying; overseas flights would be the next stage. The aircraft had then made 152 flights involving some 200 flying hours and was practically ready for a Check 3 inspection. He confirmed that the test flying programme was well up to schedule.

As reported last week in *Flight*, seven airlines, so far unnamed, are negotiating for a total of 51 Britannias in addition to the 33 firmly ordered and two provisionally ordered by B.O.A.C., and the six Britannias covered by Qantas Empire Airways' letter of intent. The Filton factory's capacity for building Britannias has been given as 25 complete aircraft a year, plus components, and the doubling of this output will be made possible by the recently announced Bristol-Short agreement providing for Britannia production at Belfast.

When the B.O.A.C. article was written last month six aircraft were in various stages of completion on the hangar floor. The *Review* states that "From the sixth production aircraft onwards the policy of prefabrication will have got into its stride and all major sections of wing and fuselage will be delivered to the assembly hall complete with all services installed—the remaining work will be merely the linking together of all these major portions. This process will take between 12 and 13 weeks for each aircraft. The present first batch of five production machines are having the services installed while they are on the floor of the assembly hall. Only the bare shells have been prefabricated, representing some 40 per cent of the work. Chiefly, the reason for this is that design of services had not in all instances been 'finalised' until flying experience with the prototype had given the designers facts on which to work."

WEATHER SHIPS: THE LATEST MOVE

THE implication that America might alter her decision to withdraw from the North Atlantic weather service was contained in a letter sent to I.C.A.O. on December 22nd by the State Department. The letter said that an American delegate would attend the ocean stations conference in Paris on February 9th to discuss the possibility of continuing the programme. "If such a determination is reached," the letter added, "the United States would expect to co-operate in a modified programme, subject to the availability of necessary appropriations in which it would seek to meet its appropriate share of the cost."

Under the present agreement America provides 14 of the 25 ships required to maintain ten stations in the Atlantic.

This contribution was clearly thought to be out of proportion to the benefits received by American operators from the weather-ship service, and the U.S. delegate at Paris is likely to demand increased financial and material support from other countries.

It has been suggested that last October's announcement of America's complete withdrawal was intended to produce a suitable atmosphere for these demands; it may also have been expressive of American impatience with a series of protracted and inconclusive I.C.A.O. conferences. There is wide agreement that abandonment of the ocean stations would have an extremely adverse effect on the reliability of weather forecasts, and thus on the continued safety of transatlantic airline operations. The need for accurate forecasts will, of course, become even more pronounced when jet airliners are introduced on the North Atlantic route. There is now little doubt that even if America had completely withdrawn her support, most of the other 14 participating nations would have maintained the weather-ship service—although perhaps on a reduced scale.

THE AMERICAN SCENE

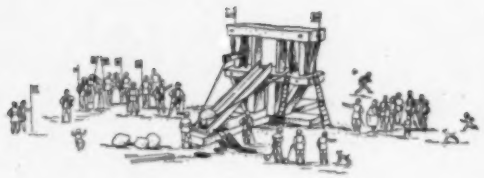
REPORTS from observers in the United States give the impression that, on the whole, celebrations of the 50th anniversary of powered flight made little impression on the American public. At the same time there appears to have been another inexplicable outburst of aviation nationalism, characterized largely by misleading statements calculated to discredit new British transports.

Information of general interest concerning American jet transports is that the overall reaction to Fairchild's proposal for the M.186 airliner announced on November 17th does not appear to have been entirely favourable. "Too small, and a bit too radical" is a typical comment.

A correspondent quotes the latest views on the Boeing, Lockheed and Douglas plans: "The opinion of those operators with whom I have discussed the Boeing is that it will be a good aeroplane—probably a bit faster than the Comet 3 but no better in any other respects; and as it will be a purely transcontinental (perhaps one stop westbound) aircraft, there won't be a rush of orders for it. It is now known that Lockheed and Douglas are both holding their horses over the medium-range jet and concentrating on a true Atlantic (at least 85 per cent of schedule) aeroplane with ducted-fan engines, though where these will come from remains to be seen. As British strength lies largely in our engines, it might well prove bad business for us to supply any to America. Lockheed are back on the engines-in-the-tail configuration, with Douglas probably favouring pods. Lockheed are said to have started to build."

U.S. INDEPENDENTS JOIN F.I.T.A.P.

FOLLOWING the latest management committee meeting of the International Federation of Independent Air Transport Operators (F.I.T.A.P.) held in Barcelona last month the total number of aircraft operated by the Federation's members has increased to 370, of which 110 are four-engine machines. Six American carriers



BARON FITZERMINE AND THE SIEGE-ENGINE

NOW this old Baron Fitzermine, was filled with fear. Daily came reports that his neighbours, the young robber barons, were preparing to strike at his ancient castle. So he sent for his armourers.

"They tell me that siege-engines are all the rage," he said. "Build me the biggest and toughest siege-engine in the whole of Mercia."

"But, sire," said the Chief Armourer, "our enemies are many and will attack from all sides. The siege-engine is essentially an attacking weapon. It would not help us to defend ourselves."

"Build me the largest siege-engine in Mercia," the old Baron thundered.

"But, sire, there are no timbers within the castle strong enough for such an enterprise. And there are no missiles large enough or heavy enough to feed such a monster."

"Use the great beams of the inner keep for your construction," said the Baron, "and use the great stones of the outer walls as your missiles."

The armourers withdrew and began their labours . . .

Seven moons later the siege-engine was completed. It was fifty-eight hands in height, and ninety-two hands long: it could hurl a projectile weighing five hundredweight a distance of fifty-two yards. The Baron was delighted.

When the invasion began the engine counter-attacked and fired two rounds in the first day. One projectile landed in a swamp and drenched the enemy with spray ; the other merely lobbed over the castle wall and rolled into the moat where it formed a bridge for the invaders.

The first direct hit from the light siege-engines of the robber barons reduced the weakened inner keep to rubble, and the first wave of assault troops crashed through the weakened outer wall like a mailed fist through matchwood.

"Your trouble," said the robber barons as they led Fitzermine away into captivity, "is that you are living in the wrong century."

"I'm beginning to think you're right," said the Baron.

In pursuance of their firmly held beliefs in matters of twentieth-century defence against air aggression, Folland Aircraft Limited, of Hamble, Hampshire, have undertaken an intensive programme of research, design and prototype development.

FOLLAND

The Short Seamew

The Short Seamew S.B.6. light anti-submarine aircraft for the defence of sea communications. Specifically designed for operation from the escort carriers of NATO forces and for inshore maritime patrols from small coastal airfields. Particular attention has been paid to the achievement of a light though extremely rugged construction; to ease of maintenance as well as the simplicity of all ancillary services. Ordered for quantity production for the Royal Navy

Shorts

THE FIRST MANUFACTURERS OF AIRCRAFT IN THE WORLD

Short Brothers & Harland Ltd.,
Queen's Island, Belfast.
London Office:
17 Grosvenor Street, W.1.

P 35

DUMMY RUN: Shown "flying" the Redifon simulator used for training B.O.A.C. Comet crews at Meadowbank is Capt. Wharton of Qantas Empire Airways. Although no order for Comets has as yet been placed by his company, it is intended that later this year Comet 2s will be jointly operated by B.O.A.C. and Qantas on the Kangaroo route to Sydney.

CIVIL AVIATION . . .

were elected to membership: Slick, Flying Tiger, Seaboard and Western, Overseas National, Californian Eastern and Trans-Ocean. Between them, these companies operate 93 aircraft—36 DC-4s, 2 DC-5As, 51 C-46s and 4 PBYs—and have on order a total of 13 DC-6As and 4 Lockheed Super-Constellations. The management committee, under the presidency of A. Cdre. Powell, also elected to membership the Icelandic airline Loftleidir, which operates DC-4s, and the Belgian airline Sobelair, which operates 5 DC-3s to the Belgian Congo. F.I.T.A.P.'s next meeting will be held in Paris on March 12th.

FERRY FARES CUT AGAIN

FOR the seventh time since Silver City Airways inaugurated their cross-Channel vehicle ferry services six years ago, fares are to be reduced in a further effort to attract extra traffic. The attempt seems certain to succeed: last year's reductions, averaging 40 per cent, resulted in an enormous increase in business, the number of vehicles carried rising from 10,000 in 1952 to 40,000 last year. Silver City state that the heavier traffic helped to improve their operating economics, making possible further reductions—from 10 to 37 per cent—which will take effect from April 15th.

The main reductions apply to a new route—from Lympne to Calais; on all five cross-Channel routes (the others are Southampton-Cherbourg, Lympne-Ostend, Gatwick-Le Touquet and Ferryfield-Le Touquet) charges will be reduced by 10 per cent on Tuesdays, Wednesdays and Thursdays.

The single fare for a small car such as the Morris Minor, when carried on the Lympne-Calais route, will be reduced from £7 10s to £6 1s 6d; a Vanguard will be carried for £10 16s instead of £12 10s; and the single fare for the largest Rolls-Royce will be reduced from £17 10s to £15 6s.

Motor cyclists will benefit considerably from the reductions—the charge for a combination, for example, will be £2 15s instead of £3 10s, and machines of less than 250 c.c. capacity will be carried for £1 7s, compared with £1 15s last year.

Silver City's private airport at Dungeness, to be known as Ferryfield, is expected to come into operation on June 1st. Thereafter all the Le Touquet services will fly from Ferryfield and Lympne will be used by the freighters serving Ostend and Calais.

About 25 per cent of the total cross-Channel traffic was carried by Silver City last year and this proportion seems certain to increase in 1954. The airline states that although some of the new fares are lower than the sea-ferry rates, direct comparison of basic fares omits such important considerations as savings in hotel, subsistence and incidental costs. As an illustration of the remarkable way in which air-ferry fares have shrunk in recent years, it may be noted that when the Lympne-Le Touquet ferry started in July 1948 the return charge for a Morris Minor plus two occupants was £54, whereas the corresponding rate for 1954 will be £21 3s. The single fare for a car of this type was £16 in 1952 compared with only £6 1s. 6d. after April 15th.

Under the energetic and determined leadership of A. Cdre. Griffith Powell, Silver City Airways seem assured of a permanent and increasing share of the cross-Channel traffic. It may well prove economically impossible for British Railways to attempt to win back traffic from the airline by making substantial reductions in sea ferry rates.

ROTORPOST: The cover reproduced here was part of the mail-load carried on a recent five-minute flight from Philadelphia International Airport to the city's main post office by the Piasecki YH-21 Workhorse—"first transport helicopter ever to land in downtown Philadelphia." It was flown by U.S.A.F. pilots.

S.A.S. PLANS

IN a recent interview with a Stockholm newspaper Mr. Per Norlin was asked to comment on re-equipment with jet aircraft. He replied that S.A.S. was not likely to take any definite stand for the next three or four years until more experience had been gained from the practical use of such aircraft by commercial operations. The president added that when the last of the airline's 14 DC-6Bs was delivered next month S.A.S. would have the largest DC-6-series fleet outside America (the company also operates 12 DC-6s).

Meanwhile, some of the airline's earlier equipment is being sold. S.A.S. have already disposed of two of their 9 DC-4s and the remainder will be progressively placed on the market. Nine of the twelve DC-3s are being retained for next summer's Scandinavian and German traffic and, as reported recently in *Flight*, the Scandia fleet is to be increased from six to eight.

N.Z. HELICOPTER COMMITTEE

THE New Zealand Government has set up a committee to study the technical and economic problems of domestic helicopter operation. Membership consists of A.V-M. Sir Arthur de T. Nevill (chairman), Assistant Director of Civil Aviation; G/C. T. F. Gill, D.S.C., R.N.Z.A.F.; W/C. R. M. McKay, A.F.C., R.N.Z.A.F; Mr O. G. James, Aviation Industry Association; Capt. H. C. Walker, N.Z.M.A.C.; Mr. C. W. Labette, N.Z.N.A.C.; and Mr. P. P. Heller of the Air Department.

The committee has been charged with compiling a report on the advisability of helicopter operation in New Zealand in the national interest; the type of helicopter best suited to conditions there; the organization to be responsible for helicopter operation; and the estimated cost to the Government of the acquisition and operation of one or more helicopters.

BREVITIES

THE first Saab Scandia assembled under licence at Fokker's original factory in Amsterdam is practically complete and is expected to make its first flight this month.

* * *

Equipment for displaying illuminated signs by night as well as for towing banners by day is fitted to a Rapide based at Southend Airport and operated by Sky Signs (1950).

* * *

The two DC-6s bought by A.N.A. from National Airlines arrived at Melbourne on December 9th after flying non-stop from Fiji. Another DC-6 which arrived at Melbourne the same day was delivered to T.A.A., which has chartered the aircraft from K.L.M.

* * *

On December 26th Sabena were to inaugurate a second weekly service from Manchester to New York. In contrast to the successful tourist service which opened last November, the new weekly flight is a "Royal Sabena" luxury service, operated with a 28-seat DC-6B.

* * *

On December 17th a DC-6B of Canadian Pacific Airlines set up an official record for the 2,700-mile direct flight from Honolulu to Vancouver, completing the journey in 8 hr 28 min flying time. Tailwinds of up to 50 m.p.h. gave the aircraft an average ground speed of some 320 m.p.h. Nine days previously a C.P.A. DC-6B flew the 4,700-mile Tokyo-Vancouver route in 13 hr 51 min.

MR. SHENSTONE'S COMMENTS

MAINLY because headline news was short before Christmas, the great British public, normally regarded as non-technical, was treated in its daily papers to a series of disturbing stories on the subject of workmanship and finish of aircraft. They arose from the remarks made by the chief engineer of B.E.A., Mr. B. S. Shenstone,* at the Institution of Production Engineers' conference at Southampton. His paper is summarized on page 19 and (continued) below; it will be seen that he said some hard words about certain aircraft of which he has had experience or knowledge.

Flight knows and respects Mr. Shenstone as a modest and capable engineer and one who does not seek newspaper publicity. We believe he must have been a surprised man when he awoke one morning to find some of his remarks broadcast and headlined in the national Press. Had his forthright comments, made before fellow technicians, been prepared in terms more suitable for public consumption—with the aid, perhaps, of a public relations officer—they would probably have passed without giving offence or even causing comment. The Institution of Production Engineers disassociated itself from his remarks.

The unfortunate aspect of Mr. Shenstone's remarks as they were widely quoted is that they seem to embrace all British aircraft, new and old. This was not, we feel sure, intended.

The aircraft industry naturally resents the attack on the quality of their products, and points out that even if justification were claimed there is ample machinery within the companies and the S.B.A.C. for correcting any wrong practices at an early stage. Moreover, B.E.A. (and, of course, B.O.A.C.) co-operate with the manufacturers at every stage from design to delivery of their aircraft, and if work were not to be up to standard the Corporation's own representative in the factory should surely have said so at once. We believe that Mr. Shenstone's main complaint concerned aircraft other than those used by B.E.A. (in view of his previous associations, Canadian experiences may have been foremost in his mind). If so, this should have been made clear at the time. The Canadian operators are very good friends of this country and must receive nothing but the best treatment.

We now quote some of the relevant official statements made just before Christmas, and in particular we print, *in extenso*, the excellent letter to *The Times* from Sir Geoffrey de Havilland.

The Society of British Aircraft Constructors wrote to Mr. Peter Masefield, chief executive of B.E.A., asking for full technical details of Mr. Shenstone's complaints, and stated:—

"The Society has maintained over many years on behalf of the aircraft industry a range of technical committees and panels manned by experts in all fields of aeronautical and ancillary engineering. This long-established machinery for technical discussion is well known throughout British aviation, and has been available to Mr. Shenstone at any time though he has not as yet made use of it on any question recognizably related to his present allegations.

"The Society has asked that the information be made available without delay so that it can be referred at once to the appropriate technical committees."

Vickers-Armstrongs simply said that they had the authority of B.E.A. to state that Vickers Viscount airliners (which have recently gone into service with B.E.A.) have given full satisfaction in respect of the matters criticized.

Sir Roy Dobson, speaking to Avro apprentices at their prize-giving, said: "If you were looking for craftsmanship, you would choose the British aeroplane every time."

The joint shop stewards' committee of B.O.A.C. at London Airport, representing eight unions, said that Mr. Shenstone's statement was "a calculated insult to the skilful craftsmanship of British aircraft workers." B.E.A. regretted that Mr. Shenstone's remarks at a purely technical conference had been interpreted as disparaging British aircraft in general. Not all the criticisms of details related to aircraft operated by B.E.A., who in particular were not the operators concerned with the rewired aircraft.

Sir Geoffrey de Havilland's comments were as follows:—

"The incorrectness of Mr. Shenstone's criticism at the Southampton aircraft production conference on Saturday of the detail finish of British airliners lies mainly in its sweeping character and in the omission of facts on the other side. It is a pity to have given an impression that British aircraft are generally inferior, and to have provided our competitors with an undeserved weapon with which they can damage our trade overseas, where the discredit will spread but the answer to it may not.

"Mr. Shenstone does not say that the teething troubles in introducing the new types of British airliner, taken all round, have compared very favourably with the troubles of introducing new American types. He does not say, for instance, that three new British airliners, two of them turbine-driven and therefore pioneers of a new means of propulsion, have been successfully introduced without having to be grounded for the eradication of major faults. He does not say that a new British turbine aircraft, quite revolutionary and altogether ahead of any other country's product, has given less trouble in its introductory period than any new American type since the war.

"So much for the damage done abroad. Among ourselves naturally we recognize the importance of maintaining a high standard of workmanship throughout our factories if we are to secure our foothold in the export markets. We know that excellent work is turned out by the craftsmen of several competing countries, not only in aircraft but in automobiles and many other exported products.

"It is, of course, necessary, by training and by meticulous inspection to keep the closest watch on quality, for which in the past British goods always enjoyed such a high reputation overseas."

Little was reported in the newspapers of the views expressed by Mr. Shenstone on interchangeability of parts. We know that he is not entirely alone in feeling that in this respect there is room for improvement in civil and in military aircraft. This is largely a matter of the extent of jigging and tooling and thus of cost and of the production numbers involved. Some British manufacturers are now able to think in terms of the same rate and scale of production of airliners as have the larger American companies for years past, and this problem should resolve itself.

We take the view that no ultimate harm will come of Mr. Shenstone's criticisms, which were undoubtedly intended to be constructive; they were based partly, though not entirely, on his past experience, and were, no doubt, in the nature of a warning.

Foreign airlines are in the main very well qualified to assess for themselves the design, workmanship, equipment and performance of the aircraft they are considering purchasing. Moreover, the virtues of the new British airliners are certainly not so marginal by comparison with those of the possible alternatives that an implied reflection upon the finish of some of the aircraft—one easily verified in each case—will blight their future.

Where the Shenstone cap does fit, those responsible should be reminded that inferior workmanship, dated practices and insufficient attention to detail do not pass unnoticed in aircraft or any other product. They do greater and more lasting harm than the words of any one man.

**Born (1906) and educated in Canada, Mr. Shenstone was with Junkers in 1929-31 and Supermarine in 1931-38; he served with Air Ministry, M.A.P. and British Air Commission, Washington and Dayton, 1938-44; was technical adviser to the Canadian Minister of Reconstruction and technical administrator for T.C.A. and Canadair, 1944-46; and was assistant to vice-president and general manager of Avro Canada, 1946-47. He took up his present appointment in 1948.*

DISCUSSING PRODUCTION (continued from page 19)

of many unstressed components and, in particular, of hinges, latches and locks. And very often it was not a removable piece of equipment which failed, but the mounting bracket, which was difficult to repair.

Mr. Shenstone then turned to the need for good workmanship and good finish: not only, he pointed out, did good finish impress the public, but it reduced corrosion, fatigue and the build-up of dirt. He said there was no excuse for the scratches and imperfections in the skinning of the wings from one factory, and suggested that "In the U.K. the average finish given to an aircraft is far inferior to that given to the average American aircraft. This was very noticeable during the war and is still in many cases quite obvious."

He continued: "Why do some British manufacturers of aircraft still find that flush riveting is too difficult and make unimpressive excuses for the use of snap-head and brazier-head rivets? There is no modern American transport with anything but flush rivets on fuselage and wing. As Heinkel pointed out before the last war, his shop people objected strongly to the use of flush riveting until he insisted on it. Whereupon they developed techniques for countersinking and control of flush rivets so that the end result was a technique just as easy to operate as the older type of riveting. The continued use of non-flush riveting on British transport makes a bad impression on the passengers and intending buyers. Aircraft with such rivetings are much more difficult to keep clean.

"Perhaps one of the worst aspects of workmanship in the U.K. at present is electrical wiring. It is sad to relate, but it is necessary to point out, that within the last two months an operator who bought new British transport aircraft has had to strip them of all their electrical wiring and renew it, before they could put this type into operation. This is a terrible slap in the face and something that will not remain unknown because the operator is so fed-up at having to do this job that it will become widely known.

"I will say no more about workmanship except that a reputation has been built up for British workmanship and it is about time we stopped living on that reputation."

A brief discussion followed Mr. Shenstone's paper. It is noteworthy, perhaps, that no speaker then questioned his criticisms.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

HEADS IN LINE: No. 500 (County of Kent) Squadron, R.Aux.A.F., performs a not unworthy echelon to starboard. The leading Meteor, with squadron markings on the tail, is being flown by the C.O., S/L. Desmond de Villiers, who is also chief test pilot to the Engine Division of de Havillands.

New Year Honours

AMONG the names of R.A.F. senior officers in the New Year Honours List, published today, are Air Marshals G. H. Mills and C. B. R. Pelly, both of whom are made Knights Commander of the Order of the Bath. These two officers are, respectively, C-in-C. of Bomber Command and of Middle East Air Force.

Air Chief Marshal Sir John W. Baker (Controller of Aircraft, M.o.S.) is made a Knight Grand Cross of the Order of the British Empire.

Other Military Division honours, and civil honours, will be listed in our next issue.

Education Adviser

ON the resignation of Dr. Keith A. H. Murray from the office of chairman of the R.A.F. Education Advisory Committee his place will be taken by Sir Lionel Whitby, Master of Downing College, Cambridge.

Sir Lionel is Regius Professor of Physics at Cambridge and was vice-chancellor of the university from 1951 to 1953.

R.A.A.F. Graduation Parade

THE reviewing officer at the graduation parade of No. 3 Entry to the R.A.A.F. College, Point Cook, was the Governor General of Australia, Field Marshal Sir William Slim.

He presented 24 awards for flying, academic and other activities at the college, the chief of which were: *Sword of Honour*, Air Cdt. W/O. P. K. Brown; *Queen's Medal*, Air Cdt. Sgt. B. T. Sweeney; *Flying Trophy*, Air Cdt. F/Sgt. P. A. Young.

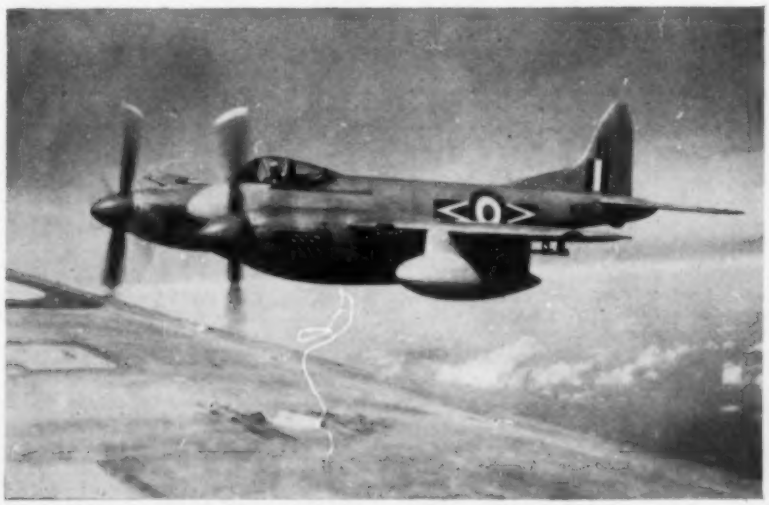
Passing out of the College were 11 pilots, two navigators and one technical cadet. The latter will go on to take a degree in aeronautical engineering at Sydney University.

R.A.F. Appointments

AMONG recent R.A.F. appointments are the following: *Group Captains.*—T. N. Coslett, O.B.E., to department of Air Member for Supply and Organization; A. Pyke, O.B.E., to H.Q. F.E.A.F. for technical and staff duties; D. M. Strong to R.A.F. Staff College directing staff; F. S. Stapleton to R.A.F. Flying College directing staff and W. R. Brotherhood to command R.A.F. Lindholme.

Wing Commanders.—B. G. Meharg, A.F.C., to R.A.F. Gutersloh administrative staff; G. C. Hibberd to department of the Chief of the Air Staff; A. E. Davies, O.B.E., to Ministry of Supply; M. C. F. Witty to air staff of No. 90 Group; J. M. Evans to Flying Training Command for air staff duties; J. Dowling, R.A.A.F., and D. W. Triptree, A.F.C., to Ballykelly.

STINGER: Rarely nowadays do we have occasion to print a photograph of a Hornet, a type little seen in the United Kingdom. In Malaya and Hong Kong, however, it is still very much alive, as is shown by this attractive photograph from No. 80 Squadron's Christmas card.



A. J. Hicks, A.F.C., to R.A.F. Hornchurch; R. A. B. Tams to H.Q. Technical Training Command; and J. H. Sindall, D.S.O., to H.Q. 2nd T.A.F.—all for administrative staff duties; C. S. W. Harte to command R.A.F. Chilmark and E. B. O'H. Bennett to the department of the Chief of the Air Staff.

R.Aux.A.F. Appointments

THE Air Ministry announces the appointment of S/L. R. B. Davidson, D.F.C., to command No. 602 (City of Glasgow) Squadron, R.Aux.A.F.; S/L. E. Evans to command No. 609 (West Riding) Squadron, R.Aux.A.F.; S/L. J. H. Dodd to command No. 2616 (South Yorkshire) L.A.A. Squadron, R.Aux.A.F.

S/L. Davidson was first commissioned in the Royal Scots in 1939 and transferred to the G.D. Branch of the R.A.F. in 1941. After operational flying in the Middle East during 1943 and 1944 he returned to Britain and became a flying instructor at No. 9 Advanced Flying Unit until his release from service in 1945. In 1947 he joined the R.Aux.A.F. as a member of No. 603 (City of Edinburgh) Squadron and a year later went back into the Regular service. His D.F.C. was an immediate award which he won in 1944 while flying R.P. Hurricanes with No. 6 Squadron, then known as the "Flying Tin Openers."

S/L. Evans first enlisted in the R.A.F.V.R. in 1939 as an electrician but remustered for aircrew duties in 1941 and was commissioned in 1942. He, too, served in the Middle East—with No. 32 Squadron—until the end of the war in Europe. He left the Service for a short while but returned in 1946 and was later granted a permanent commission. Recently he has been Senior Administrative Officer at Church Fenton, has served with No. 226 Operational Conversion Unit and attended a course at the Central Fighter Establishment.

S/L. Dodd has specialized in code and cypher duties. After being commissioned in 1943 he served at A.H.Q. West Africa, at H.Q. No. 298 Wing and, after returning to England, at H.Q. Transport Command. When released in May 1946 he joined the R.Aux.A.F.

R.N. Bird-watching Society

LAST month a small private exhibition was held in London of photographs and paintings by members of the Royal

SERVICE AVIATION . . .

Naval Bird-watching Society. It was organized by Capt. G. S. Tuck, D.S.O., R.N.

The society was formed seven years ago and one of its objects is to increase existing knowledge of seasonal bird distribution. A close liaison is also kept with the Air Ministry Meteorological Office to help in identifying unknown birds seen by ships sending in weather reports.

During 1953 members of the society have visited places as far apart as the Greenland Ice Cap and the Antarctic. Reports have also come from Korean waters.

President of the society is Admiral The Mackintosh of Mackintosh, C.B., D.S.O., D.S.C., D.L., R.N.

Air/Desert Rescue

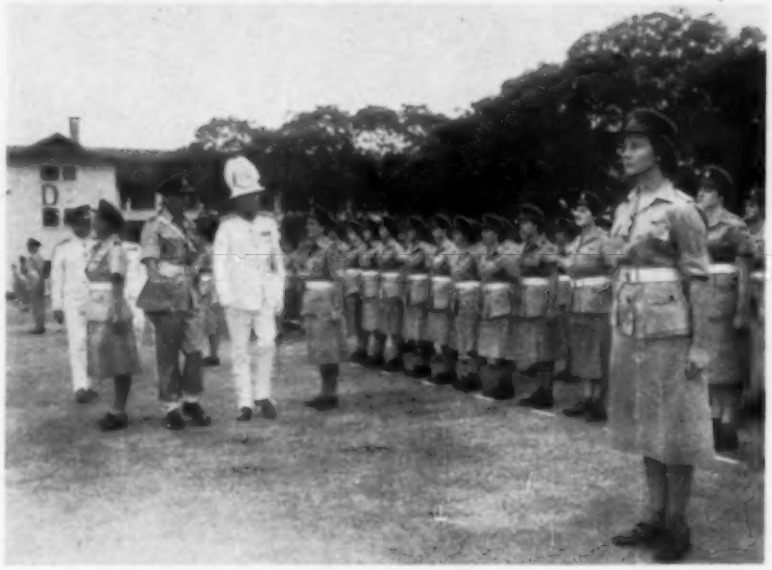
BRITISH Army headquarters, Cyrenaica, has thanked the Royal Air Force for its part in the recent rescue, in the Libyan desert, of two men of the Sherwood Foresters, who were cut off by flood waters south of Derna. The rescued men were in a party of four Foresters who were crossing the desert to Derna in a jeep and a half-track vehicle when sudden heavy rains obliterated the desert track.

When the party failed to arrive at Derna, an appeal was made to R.A.F. Station El Adem, a desert staging post 18 miles inland from Tobruk. The station immediately passed the message to its Anson, which was already airborne on a search for another Army vehicle isolated by flood waters. Having found this vehicle, and dropped food, water and blankets to its occupants, the aircraft carried on searching for the four men and two vehicles. Very heavy rain and bad visibility, however, forced it back to base. The next day two more sorties were flown over the desert, but without success.

Towards midnight news came that two of the soldiers had been rescued by Army ground parties. Next morning El Adem's Search and Rescue Unit—of motor vehicles specially equipped for desert work—left for Derna, while the Anson made two more unsuccessful searches.

An Avro Shackleton of Coastal Command from Malta was then flown to the desert and, after being briefed from the ground by radio-telephone, took over the search. Shortly after dawn next day the Shackleton, after combing a wide area of trackless desert, sighted the missing men. Dropping a flare to let them know they had been seen, and to pinpoint their position, the aircraft flew over the nearest ground search party. Continuing to mark the missing men's position with flares, and flying back and forth between the spot and the ground party, it guided the rescuers to where the Foresters were lying.

PRIZE-WINNERS: Three R.A.A.F. cadets who took the chief prizes at the recent passing-out parade. (Left to right) Air Cdt. Sgt. B. T. Sweeney, Air Cdt. W/O. P. K. Brown and Air Cdt. F/Sgt. P. A. Young. (See "R.A.A.F. Graduation Parade," on page 25.)



MALAYAN INTERLUDE: The Governor of Singapore, Sir John Nicoll, inspects the W.R.A.F. during a recent ceremonial parade to present a badge to Air Headquarters Singapore. The badge bears the Malayan motto "Kita Sokoang Singa" (We Support the Lion).

Changes at Ternhill

THE presentation of wings next Tuesday at No. 6 F.T.S., Ternhill, Salop, by A.V-M. G. D. Harvey, A.O.C., No. 23 Group, marks a distinct change in the function of the school. These 20 pilots are the last to complete their training at Ternhill, which has now been re-equipped with Percival Provosts and will in future concentrate on the basic training of pilots under the new Provost/Vampire sequence. Future pupils will qualify for their wings on Vampire Trainers.

R.N.V.R. to Train N.S. Pilots

AIR Divisions of the Royal Naval Volunteer Reserve are to undertake the final stages of the training of a proportion of the young men qualifying as officer pilots in the Navy during their National Service. These units will provide specialized operational training during the last six months of the two-year period of service.

National Service pilots are required to spend three and a half years in the R.N.V.R. after their full-time service and it is those who are capable of fulfilling the maximum training obligations on their return to civilian life who are likely to be selected to complete their training with one of the Air Divisions.

Hitherto, these officers have been sent to anti-submarine or fighter operational flying schools, according to the branch of air warfare in which they specialize, and the decision that they should go to R.N.V.R. squadrons will result in a reduction in the burden of training commitments placed on these establishments. Other N.S. pilots will go to R.N. shore-based units to complete full-time National Service.

During the first eighteen months' service they qualify up to wings standard at R.A.F. Station Syerston, near Newark-on-Trent, and receive preliminary Naval operational training at Culdrose and Yeovilton.

The first N.S. aircrew have gone to the Northern Air Division R.N.V.R. at R.N. Air Station Stretton, Lancs., the Scottish Air Division R.N.V.R. at R.N.A.S. Abbotsinch, near Paisley, and the Southern Air Division at the R.A.F. Station Benson (Oxfordshire).

Other R.N.V.R. Air Divisions are the Channel Division at R.N.A.S. Ford (Sussex) and the Midland Division at R.N.A.S. Bramcote, near Nuneaton. It is also intended to establish shortly an R.N.V.R. squadron for the West Country at R.N.A.S. Yeovilton (Somerset).

No. 6 Squadron's 40th Anniversary

THE Chief of the Air Staff, Air Chief Marshal Sir William F. Dickson, has accepted an invitation to attend the 40th Anniversary Dinner of No. 6 Squadron at the Belfry Club, West Halkin Street, London, on January 31st next.

Past and present members of the squadron who wish to attend the function should get in touch with S/L. B. J. Fowler, A.F.C., R.A.F. Warton, Preston, Lancs. Tickets are 37s 6d, including drinks (pre-dinner) and wine.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

The Wonder of 50 Years Ago

"THE First Fifty Years" (the feature article in your special number of December 11th) was, I think, superlative and probably far more absorbing to the non-expert than many Farnborough editions. I now have a feeling that some of us have been looking with too much wonder upon developments of today; and I was astounded to hear from the B.B.C. that the Wrights used a wind tunnel!

Harrogate, Yorks. ALLAN GREAVES.

[We are grateful for our correspondent's appreciation—one of a number we have received. Incidentally, the Wright brothers' use of a wind tunnel was the subject of two references in the issue mentioned.—Ed.]

Almost Overlooked

I WAS sorry to note that, in the B.B.C.'s recent one-hour feature on fifty years of flying, the first Englishman to become a popular hero with the British public, Claude Grahame-White, was dismissed in two or three words. It seemed to have been overlooked that he was the first Englishman to pass successfully the tests necessary for an official pilot's certificate, the first Englishman to make a cross-country flight in this country, the first man in the world to make an aeroplane flight at night, and the first Englishman to win a big international aeroplane contest (the Gordon-Bennett of 1910).

Epsom, Surrey. HARRY HARPER.

Jet Trainers

IT seems to me that the sting of "S.H.E.'s" letter in your issue of November 20th is in the tail. His assertion that there is a Commonwealth demand for a four-five-seater personal plane powered with a 250 h.p. turboprop engine appears to have led him to find arguments in favour of a Service trainer powered with just such a unit.

Since, however, the Air Staff are concerned with producing pilots capable of handling the fantastically expensive V-bombers and all-weather fighters, the economics of modern Service-pilot training must be viewed against the background values of modern operational aircraft.

Because such an *ab initio* trainer as "S.H.E." advocates would be so far removed in power, performance and equipment from the advanced type of trainer it is clear (as "S.H.E." admits) that an intermediate trainer would be needed. Even if such a trainer were produced, this would mean a return to the three-type scheme which, with its additional spares provisioning, etc., is such a nightmare to the equipment and engineering branches of the Service.

One of the main Service problems is to discover the inept trainee as early as possible during training (synthetic aptitude-tests are still far from infallible) and it is this more than anything else that has sounded the death knell of the "simple" *ab initio* trainer which, by its very simplicity, permits all and sundry to be taught to fly and thereby passes along the training channel many who will fail at a later stage.

Quite apart from the obvious waste of time and effort that late failures cause, the demoralizing influence on the failed pupil (not to mention his instructors) is incalculable but very real.

No other person has as much influence on a pupil as has his first instructor. Lessons learnt during the early impressionable hours are not easily forgotten; and surely it makes sense that, since 90 per cent of Service aircraft will be jets, this is the power source which should be used throughout training. It is admitted that the 10 per cent of pilot graduates who will operate piston or turboprop aircraft will require special conversion courses, but, because the numbers will be so few, it will be possible to make these courses prolonged and thorough.

If the Provost/Vampire training sequence now introduced into the R.A.F. is the success which is anticipated, it is logical to suppose that the Provost could be replaced by an *ab initio* trainer of similar weight and performance but powered with a jet engine. Far from being expensive for the taxpayer, such a trainer might well prove most economical because, whereas the present Provost/Vampire sequence gives an approximately equal share of hours to each type, the *ab initio* jet trainer might be expected to take over a higher proportion of the total, thus enabling a corresponding reduction to be made on the more costly advanced trainer.

It is, therefore, most fortunate that the Viper jet engine is available, giving a thrust which would seem to be almost ideal for the trainer envisaged; and one eagerly awaits the appearance of the Viper Provost, which is due to be delivered [a small number for trial and evaluation—Ed.] to the Royal Air Force this year (1954).

London, W.C.2. A.C.B.

Thrust—Limited and Otherwise

WITH reference to your comment (P.742, December 4th) on Mr. LaPierre's article it may be true that *some* British designers foresaw limitation of thrust. Indeed it was true, lamentably true, that some British designers foresaw no thrust at all!

Among the initiates, however, I knew none who doubted that thrusts would increase. Whittle propounded a layout, in about 1941, for 10,000lb-plus; Power Jets seriously considered it, and indeed never rejected it.

Mr. LaPierre's implication that there was an "imaginary barrier" to higher thrust, which barrier was broken by America, is unworthy of the excellent work done by his and other American firms, although consistent with other sporadic publicity efforts (to which I am sure Mr. LaPierre would not subscribe) made in America to establish that country as the progenitor of turbojet propulsion.

As to "life." Some Power Jets engines designed and built between 1940 and 1942 had a very much greater actual life than that attributed to certain engines now (or until recently) in full production. There are quite a number of W2/700s, for example, which are still running and giving close to their original performance—usually in "hack" circumstances, where maintenance is at a low ebb, and frequent starts and vehement accelerations make up most of their time.

London, W.1. PATRICK JOHNSON.

FORTHCOMING EVENTS

Dec. 31-Jan. 13. National Schoolboys' Own Exhibition, Horticultural Halls, Westminster.
Jan. 2. British Interplanetary Society: "Cosmic Radiation Hazards in Space Flight," by Dr. L. R. Shepherd, Ph.D.
Jan. 6. Institute of Metals: Informal discussion, "Lubricants for Non-ferrous Metal Working."
Jan. 7. R.Ae.S. "Young People's" Lecture: "The Fun of Finding Out in Flying," by Sir Leonard Bairstow, C.B.E., F.R.S., Hon.F.R.Ae.S.
Jan. 9. British Interplanetary Society (North-west Branch): "Our First Goal—the Moon," by P. A. Moore, F.R.A.S.
Jan. 12. Institution of Civil Engineers: "Control of Movement at Airports," by Clifford Hayes and E. J. Dickie.
Jan. 15. Institute of Navigation: "Methods of Air and Surface Navigation," by W/C. E. W. Anderson, D. H. Sadler, Lt. Cdr. R. B. Michell, R.N., and G/C. E. Fennessy.
Jan. 16. British Interplanetary Society (Midlands Branch): Brains Trust.
Jan. 16. British Interplanetary Society (Provisional Yorkshire Branch): Short-paper evening and Brains Trust.
Jan. 18. Photogrammetric Society: "New Stereoscopic Plotting Instrument for Aerial Photographs," by Professor E. H. Thompson.
Jan. 21. R.Ae.S. Main Lecture: First Mitchell Memorial Lecture, by J. Smith, C.B.E., F.R.Ae.S. (at Southampton).
Jan. 22. Helicopter Association: Brains Trust.
Jan. 23. British Interplanetary Society (Provisional Western Branch): "Astronautics in the Next 25 Years," by E. Burgess, F.R.A.S.
Jan. 23. Aircraft Recognition Society: All-England Recognition Contest, Royal Institution, London.
Jan. 26. R.Ae.S. Section Lecture: "X-ray Metallography," by Dr. G. L. J. Bailey.
Jan. 25-29. Institute of the Aeronautical Sciences: 22nd Annual Meeting, New York.
Feb. 4. R.Ae.S. Section Lecture: "Air Intake Efficiency," by F. B. Greatrex, B.A., A.F.R.Ae.S.
Feb. 5. Photogrammetric Society: "New Plotting Machine for Air Photographs," by J. E. Odle.
Feb. 6. British Interplanetary Society: "Progress towards Astronautics," by K. W. Gatland.
Feb. 10. Radar Association: "Secondary Radar," by K. Harris.
Feb. 11. R.Ae.S. Main Lecture: "Recent Developments in the Structural Approach to Aeroelastic Problems," by Dr. D. Williams, M.I.Mech.E., F.R.Ae.S.
Feb. 18. R.Ae.S. Section Lecture: "Helicopter Research," by F. J. O'Hara, A.R.Ae.S. (jointly with the Helicopter Association).
Mar. 2. R.Ae.S. Section Lecture: "Metal Sandwich Construction," by F. Tyson, B.A., A.F.R.Ae.S.

R.Ae.S. Branch Fixtures (to Jan. 15).—Jan. 4, *Bristol*, "Review of Developments in Aircraft Equipment," by G. H. Dowty. Jan. 6, *Belfast*, joint meeting with Queen's University Film Society; *Luton*, Wilbur Wright Centenary film; *Brough*, "New Developments in Aircraft Production Engineering," by Professor J. V. Connolly; *Chester*, "Guided Weapons," by D. J. Lyons.

Jan. 11, *Birmingham*, joint meeting with Institute of Rubber; *Halton*, "The Propeller Gas Turbine," by A. C. Clinton. Jan. 13, *Hatfield*, "Stability and Control in Aircraft Design," by J. C. Wimpenny; *Weybridge*, "Sailplane Design," by K. G. Wilkinson. Jan. 14, *Isle of Wight*, "Large Press Forgings," by E. T. Stewart-Jones. Jan. 15, *Glasgow*, "The Pilot's Point of View," by Officers of Glasgow U.A.S.

THE INDUSTRY

Hawker Apprentice Prizes

A LITTLE over two years ago several of the original apprentices of the Sopwith Aviation Co., Ltd., forerunner of Hawkers—all of them men who had subsequently made their mark in the aviation and other industries—decided among themselves to present a trophy for annual competition among the present-day apprentices of the company.

On December 18th, in the canteen of the Kingston factory, the trophy (a shield of impressive design) was presented for the third time. The winner on this occasion, as best apprentice of the year, was T. Opatowski. J. H. Dawson was awarded the prize for the best trade apprentice and D. N. Shackles was rewarded as a Higher National Certificate winner.

Mr. Neville Spriggs (who is now managing director of the Kingston and Blackpool companies), presenting the awards, reminded his audience that the whole of the executive had started their careers with the firm as "ordinary young lads"; it was Hawkers' policy that any bright boy would be encouraged to take his place at the top in due time.

The prize presentation was preceded by the annual distribution of clocks as long-service awards—the recipients of which included Mr. W. G. H. Rayner, assistant works manager at the Richmond Road factory—and by the showing of the Shell film *The Story of the Century*, direct from its première at the R.Ae.S.-R.Ae.C. Wright Jubilee Dinner the previous evening.

The film, with its nostalgic scenes of flying during and before the Kaiser's war, brought appreciative comments from the several ex-R.F.C. pilots present, though there was a feeling that the Second World War sequences rather casually dismissed the part played by the Hurricane.

Alluding to this in a subsequent speech, Sir Sydney Camm said that the Hurricane first flew in 1935. In 1937 the firm designed something much more powerful—the Typhoon. Hurricane production might have been delayed in its favour; but it was not—with fortunate results for Britain in the summer of 1940.

Other speakers at the presentation were Mr. J. T. Lidbury (general manager) and, on behalf of the former apprentices, Mr. R. W. Sutton, who was a Hawker director from 1934 to 1941 and is now a consultant.

New Protective Finish

THE Adelaide Engineering Co., of Liverpool, makers of "Cowanite" zinc and latex rust inhibitor, announce a new protective finish developed by Dr. Michael Cowan and known as "Alumintex." Consisting of aluminium and latex, combined with carrying agents, it is claimed to have lasting qualities considerably greater than those of aluminium paint. It can be applied direct to all industrial metals, wood, asbestos, stone and slate, and over adherent rust, scale and paint. Details are obtainable from the company's offices at 7 Waterloo Road, Liverpool 22.

D.C. Ratiometer Indicators

THE British Standards Institution has published a revision of G.114, *Direct-current Ratiometer Indicators for Aircraft*. This revised Standard includes data relating to platinum resistance thermometer elements in addition to that given in G.114 (April 1949) for nickel resistance thermometer elements. An appendix has been added, giving information on minimum tests recommended to verify the serviceability of instruments manufactured in compliance with the requirements of the standard.

Copies of the revised British Standard, No. 2, G.114, are obtainable from the B.S.I. sales branch at 2, Park Street, London, W.1, price 2s. 6d. net.

For Factory Floors

A NEW floor-cleaning machine for industrial use employs battery power and thus obviates the inconvenience of a trailing cable. Made by S. R. Cowland, Ltd., of Birmingham, and known as the Cowland C50A, it consists fundamentally of a cast aluminium base—suspended on an adjustable front caster and two rear wheels—upon which is mounted a divided tank, one half for water and detergent and the other for dirty water. This tank is flanked by two 12-volt Exide traction batteries connected in series to power a B.T.H. 1 h.p. motor, which drives twin rotary cleaning brushes, and a ½ h.p. 11,200 r.p.m. suction motor driving a fan which exhausts the air from the dirty-water tank. Mounted on the guiding handles are the motor switches and water- and suction-control levers.

In operation, the cleansing solution is gravity-fed from its four-gallon tank to a sprinkler system immediately ahead of the brushes. Then, as the machine passes over the scrubbed portion of the floor, the dirty water is piled up by trailing squeegee rubbers attached to the suction bar at the rear and sucked into the other half of the tank. This system is stated to be so efficient that the clean floor is dry within seconds of the machine's passing.

The quickly interchangeable aluminium-backed brushes, which together cover an area 19 in wide, intermesh in the manner of gears, so that no unscrubbed streak is left behind on the floor. If grease-encrusted floors are to be dealt with, the machine can be fitted with wire scratch-brushes for the initial cleaning. The sole selling agents for the C50A machine are Industrial Colloids, Ltd., Altrincham, Cheshire.

An Old-Timer Retires

NEWS reaches us of the retirement of Mr. Frederick Mayer, at the age of 67, from the post of chief installation engineer in the engine division of the Bristol Aeroplane Co., Ltd. He was due to retire at the usual age of 65, but stayed on to see the power-units for the Beverley, Princess, Britannia and Olympus-Vulcan through their initial flight-tests. Mr. Mayer was associated with various aircraft and engine experiments as far back as 1910, and in 1915 was on the engine inspection staff at Farnborough, whence he was seconded to the Bristol Company (then the British and Colonial Aeroplane Co.) as chief engine examiner. A year later, by which time he was serving in the R.F.C., he was posted to No. 5 Aircraft Acceptance Park, Filton, where he was concerned with engine, armament and flight-testing of aircraft built by Bristols and other West Country constructors. In 1919 he joined the Bristol Company, and in 1921 was transferred to their newly formed engine division as chief installation engineer under Mr. A. H. R. (now Sir Roy) Fedden. From then onwards he was responsible for supervising the servicing of engines at the flying school, on the test beds and in experimental installations; he also organized a technical liaison service with customers at home and abroad, which took him to many countries of Europe, the East and even—for winter and summer trials—the Arctic and the tropics. He has handled engine installations in over 250 different varieties of prototype aircraft.

Mr. Mayer.

IN BRIEF

The Aluminium Castings Co., Ltd., announce that Mr. John MacNish, C.A., of Charterhouse Industrial Development Co., Ltd., has been appointed a director of the company to fill the vacancy caused by the death of Mr. R. S. Dyball.

* * *

Subjects dealt with in a recent issue of *Magnolia Metals Review* (*Practical Data on Lined Bearings*) include "Metallography in the Service of Engineers" and "Surface Finishing—a New Approach." (Magnolia Metal Co. of Great Britain, Ltd., 34 Victoria Street, London, S.W.1.)

* * *

Mr. J. R. Harding, B.Sc.(Eng.), M.I.E.E., has been appointed assistant general manager of Pirelli-General Cable Works, Ltd. He joined the company in 1925 and has been successively a district engineer, manager of overhead lines department, deputy sales manager for rubber cable, and joint sales manager (with Mr. R. J. Willoughby) for paper cable.

* * *

The production of castings by the use of anodized aluminium dies is described in a new publication *"Niforge" Stress-Free Castings by the Parlanti Process*. Copies are available from Carron-Parlanti, Ltd., Carron, Falkirk, Stirlingshire. Of particular interest are the physical data showing heat-transference during casting.

* * *

Mr. R. J. Ashley, managing director of Skyways, Ltd., from 1946 to 1952 has joined Armstrong Siddeley Motors, Ltd., as general manager of their car division. Mr. Ashley, who was an air display pilot from 1934 to 1936 and was with Olley Air Services from 1937 to 1940, served with the R.A.F. during the war and was seconded to Railway Airways Joint Committee (1941-42) and to British Overseas Airways Corporation (1942-46).

PROCESS TIMERS—TIME SWITCHES AND CONTROLLERS —FUSING MECHANISMS—

Progress by the BRITISH, FOREIGN & COLONIAL AUTOMATIC LIGHT CONTROLLING CO., LTD., is the result of more than 50 years research and experience. The present range of products includes heavy and light duty controlling switches for all lighting and electrical purposes, operated either by hand-wound clockwork, synchronous motor or motor driven with mechanical spring reserve. Also manufactured are Aircraft Oxygen Regulators and Emergency Equipment.

THE BRITISH FOREIGN & COLONIAL AUTOMATIC LIGHT CONTROLLING CO. LTD.

CHEMRING LIMITED
Rador Reflectors for Stratospheric Wind Finding. Towed Targets. Instrument Jacket Heaters. Nylon Body Armour.

SUCAL INDUSTRIAL CLOTHING LTD.
Armoured Waistcoats and Trousers. Uniform Clothing. Flying Clothing of all types. Fire Resisting Clothing and Rescue Equipment. Electrically Heated Clothing and Equipment.

DOWSING COMPANY (ELEC. MFRS.) LTD.
Aircraft Parts and Sub-assemblies. Electrically Heated Appliances. Electrical Switchgear.

SUCHY DIVISION INC., 1775 BROADWAY, GENERAL MOTORS BUILDING, NEW YORK 19, N.Y. U.S.A.

SUCHY HOLDINGS LIMITED · 62-64 TEMPLE CHAMBERS TEMPLE AVENUE LONDON E.C.4

FLIGHT and AIRCRAFT ENGINEER

PRESS DAY — *Classified advertisement "copy" should reach Head Office by* FIRST POST THURSDAY *for publication in the following week's issue subject to space being available.*

CLASSIFIED ADVERTISEMENTS

Advertisement Rates. 4/- per line, minimum 8/-, average line contains 6-7 words. Special rates for Auctions, Contracts, Patents, Legal and Official Notices, Public Announcements, Tenders 5/- per line, minimum 10/-. Each paragraph is charged separately, name and address must be counted. All advertisements must be strictly prepaid and should be addressed to FLIGHT Classified Advertisement Dept., Dorset House, Stamford Street, London, S.E.1.

Postal Orders and cheques sent in payment for advertisements should be made payable to Iliffe & Sons, Ltd., and crossed & Co.

Trade Advertisers who use these columns regularly are allowed a discount of 5% for 13, 10% for 26 and 15% for 52 consecutive insertion orders. Full particulars will be sent on application.

Box Numbers. For the convenience of private advertisers, Box Number facilities are available at an additional charge for 2 words plus 1/- extra to defray the cost of registration and postage, which must be added to the advertisement charge. Replies should be addressed to "Box 0000, c/o Flight," Dorset House, Stamford Street, London, S.E.1.

The Publishers retain the right to refuse or withdraw advertisements at their discretion and do not accept liability for delay in publication or for clerical or printer's errors although every care is taken to avoid mistakes.

Situations Vacant. The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service etc. if the applicant is a man aged 18-64 or a woman aged 18-59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

---

15 CHESTERFIELD ST., W.1
Telephone : GROsvenor 4841

AIRWORK LIMITED

AIRCRAFT SALES SINCE 1930

Consult us with confidence before Buying or Selling any type of Aircraft. You pay nothing for our advice and experience. We advertise for sale only aircraft available on our own premises or for which we have the sole selling rights.

AIRCRAFT FOR SALE

W. S. SHACKLETON, LTD.

EUROPE'S LARGEST AIRCRAFT DEALERS

(Twenty-two years at this address and 128 different types of aircraft sold)

NEW YEAR BARGAINS

£2,100 D.H. Chipmunk. Price reduced by £450 to ensure immediate sale. This machine is a unique bargain and is offered at a good deal less than half the present list price. It is absolutely as new. Year's Certificate of Airworthiness. Under 350 hours since new. Gipsy Major 10 Mark 2 engine. Dual controls, full panels, Murphy V.H.F. with intercomm., navigation lights, cartridge starter, etc.

OFFERS WANTED

£???? AIGLET Trainer. Built 1952. Gipsy Major engine. Year's Certificate of Airworthiness. Under 250 hours since new. Metal propeller, starter, battery, generator, extra wing tank, full blind flying panel, aerobatic seats, bench rear seat. Silver and black. Believed to be the only Aiglet Trainer on the market.

W. S. SHACKLETON, Ltd., 175 Piccadilly, London, W.1. Tel.: HYDe Park 2448-9. Cables: "Shackhud, London." [0070

R. K. DUNDAS, LTD.

(Europe's largest stockists of reconditioned Austers)

AS 1953 drew to a close we looked back with pleasure and satisfaction at the records of our numerous shipments and deliveries of aircraft to friends in all parts of the world during the past twelve months.

THE pleasure and satisfaction are all the more complete in the knowledge that similar sensations are shared by the recipients of the aircraft.

AND to look forward, we wish all avistors a successful and prosperous New Year.

R.
K.
DUNDAS, Ltd.,

29 BURY STREET, St. James's, London, S.W.1. Cables: "Dundasaero, London."

CROYDON AIRPORT, CRO. 7744. Cables: "Dundassero, Croydon." [0559

AEROSERVICES (LONDON) LIMITED

Draw attention to the new service offered to Owners and Operators of LYCOMING AUSTERS where an aircraft when flown into Croydon can receive an engine change the same day at an all-in price, using an engine from their own large stocks.

ANOTHER service for the Operator of DAKOTAS includes supply of newly overhauled Stromberg carburettors (PD12F5 or PD12H4) on direct exchange. A newly overhauled carburettor despatched the same day advice is received old carburettor has been shipped. Our stocks at your disposal.

There are numerous other services available to Operators who are invited to address their problems to:—

AEROSERVICES (LONDON) LIMITED

CROYDON AIRPORT
SURREY
Tel.: CROydon 9373
Cables: "Aeroserv, Croydon." [0940

---

2 Auster Autocrats: G-AIRE, C. of A. to April, engine 350 hrs., airframe 1,200 hrs. G-AHSI, engine 430 hrs., airframe 1,250 hrs., 12 months C. of A., metal prop, gyro compass. Both aircraft fitted with long range tanks and in excellent condition, £675 each. £500: Percival Proctor V, only 125 hrs. since new; engine 45 hrs., with new C. of A. and in perfect condition. All can be inspected at Southampton.

V. H. Bellamy, c/o Flightways Ltd., Southampton Airport. Phone: Eastleigh 87669. (Twyford 3357 night.) [1424

HELMETS
MASKS
TUBES
RECEIVERS
GOGGLES
SPARES, etc.

We are the complete stockists for pilots' personal flying equipment of civilian and service pattern.

Send 3d. for Illustrated Catalogue

Special terms to Flying Clubs

D. LEWIS LTD. (DEPT. F)
124 GT. PORTLAND ST., LONDON, W.1
Tel. Museum 4314 *Grams: Aviakit, Wesdo, Londo*

ADCOLA
(Regd. Trade Mark)

SOLDERING INSTRUMENTS
SOUND Joints
for
SOUND Equipment

Any voltage range supplied 6/7 to 230/250

- Standard model for radio maintenance, etc. Detachable bit type.(Factory Bench Line)
- Equally suited to daily or intermittent use
- Consumption: 25 watts
- Total length of instruments. 9 inches

Made in England Registered Design British, U.S.A., & Foreign Patents

- *Apply Sole Manufacturers and Suppliers*

ADCOLA PRODUCTS LTD.
Sales, Offices & Works: *MAC aulay 4272*
CRANMER COURT, CLAPHAM HIGH ST., S.W.4

AIRCRAFT SPRING WASHERS

TO B.S. SPECIFICATION S.P.47

CROSS MFG. CO. (1938) LTD., COMBE DOWN, BATH

AIRCRAFT FOR SALE

VENDAIR OF CROYDON AIRPORT offer:

AUSTERS, Taylorcraft, Proctors, Messengers, Gemini, Magisters, Ansons, Fairchild Argus. VENDAIR, Croydon Airport. Croydon 5777. [0603

AUSTER J4, Cirrus Minor engine, 300 hours approx.; airframe 700 approx. V.H.F. Murphy single-channel 1197, navigation and panel lights, D.G., etc. 3 years' C. of A. Finished in red and silver. £525 or exchange for Miles Messenger and cash adjustment.—R. R. Harrington, 10 Orchard Close, Edgware. Tel.: EDG 3610. [1450

AIRCRAFT WANTED

OUR demand for good used aircraft of all descriptions is very great. Operators or owners wishing to dispose of aircraft, engines, or anything aeronautical, are asked to communicate at once to:—R. K. DUNDAS, Ltd., 29 Bury Street, London, S.W.1. WHI. 2848. Cables: "Dundasaero, Piccy, London."

CROYDON AIRPORT. CRO. 7744. [0558

AIRCRAFT ACCESSORIES AND ENGINES

A. J. WALTER.

NOTICE to Dakota operators:—

OUR vast stock of airframe spares, instruments, accessories, etc., is available to assist you to keep flying with the minimum of time spent on the ground due to service troubles. Whatever your requirements, do not hesitate to contact us, by letter, telephone or cable, or alternatively by a personal visit, when we shall be pleased to show you the stocks held at Gatwick Airport.

OUR Associate Company, A. J. W. (Instruments), Limited, can undertake any instrument overhaul work and we also provide facilities for an exchange scheme on instruments at overhaul prices.

A. J. WALTER, Gatwick Airport, Horley, Surrey. Tel.: Horley 1420 and 1510, Ext. 105. Cables: "Cubeng, London." [0268

BRITISH and American filaments; landing lamps; fuses, generators, gyros, cabin heaters, spares.—Suplex Lamps, Ltd., 239 High Holborn, London W.C.1. Tel.: Hol. 0225 and 4543. [0433

AIRCRAFT SERVICING

BROOKLANDS AVIATION, Ltd., Brooklands Aerodrome, Weybridge. C. of A. overhauls, modifications and conversions. Tel.: Byfleet 436. [0305

REPAIRS and C. of A. overhaul for all types of aircraft.—Brooklands Aviation, Ltd., Civil Repair Service, Sywell Aerodrome, Northampton. Tel.: Moulton 3218. [0307

AIRCRAFT FOR HIRE

PIPER Cub—hire and fly yourself. Moderate rates, hour, day, week or month.—A. J. Walter, Gatwick Airport, Horley, Surrey. Tel.: Horley 1420 and 1510. [0269

BUSINESS OPPORTUNITIES

WYNSTRUMENTS, Ltd., of Staverton Aerodrome, Gloucester, are open to consider the development and/or manufacture of inventions relating to aircraft instruments or small electrical accessories. Particulars should be addressed to the Managing Director. [1252

CAPACITY AVAILABLE

PRECISION engineers. Personal service for prototypes, small quantity machined parts and equipments to drawings and sketches. A.I.D. approved. Mech. and Elec.—Cathanode, Ltd., Vineyard Walk, Clerkenwell, E.C.1. Tel.: TERminus 2231. [1280

CLOTHING

R.A.F. and R.N. officers' uniforms purchased; large selection of R.A.F. officers' kits for sale, new and reconditioned.—Fisher's Service Outfitters, 85-88 Wellington St., Woolwich. Tel.: Woolwich 1055. [0567

CLUBS

VENDAIR FLYING CLUB. Night flying and instrument flying. Croydon Airport. CRO. 5777. [0608

REDHILL FLYING CLUB, Redhill Aerodrome, Surrey, for flying instruction. Open 7 days a week. Nutfield Ridge 2245. [0348

LONDONERS! Your most accessible and reasonable club. M.C.A. approved courses. Austers 45/- hour, trial lesson 17/6. Phone Penguin Flying Club, Vic. 1300. [0285

EAGLE

SERVICE MAINTAINS YOUR HIGH STANDARDS

- Aircraft Servicing.
- Overhaul and Modification Service.
- Spares—Large Stocks.
- Equipment and Component Parts.
- Purchase and Sale of Aircraft.

A.R.B. & A.I.D. APPROVED

E.A.S.L

EAGLE AIRCRAFT SERVICES LIMITED

A COMPANY OF THE EAGLE GROUP

Blackbushe Airport, Camberley, Surrey

Telephone: Yateley 2371 (p.b.x.)

London Office: 29, Clarges Street, London, W.1

Telephone GRO 6411

CLUBS

HERTS and ESSEX AERO CLUB, Broxbourne Aerodrome, Nazeing, Essex. M.C.A. approved 30-hour course; residential; trial lessons, 35/-; train from Liverpool Street or Green Line Coach 715. Tel.: Hoddesdon 2453, 2421. [0230

CONSULTANTS

GROUP CAPT. E. L. MOLE, B.Sc., A.F.R.Ae.S., 31 Dover St., London, W.1. Gro. 5902. [0400

WING COMMANDER R. H. STOCKEN, F.R.Ae.S., Eagle House, 109 Jermyn St., London S.W.1. Tel.: Whitehall 8863. [0419

R. K. DUNDAS, Ltd., have been giving the correct answer to aviation problems for twenty years. Technical. Purchasing. Operations. Marketing. 29 Bury Street, London, S.W.1. WHI. 2848. [0560

MISCELLANEOUS

HALL aero engine electric valve-seat grinder with diamond wheel dresser. New and unused, £25. Another slightly used, £15.—Wood, Bell Lane, Henley. Tel. 1137. [1445

PACKING AND SHIPPING

R. AND J. PARK, Ltd., 143-9 Fenchurch St., E.C. Tel.: Mansion House 3083. Official packers and shippers to the aircraft industry. [0012

EXPORT PACKING SERVICE, Ltd., Imperial Buildings, 56 Kingsway, W.C.2. Phone: Chancery 5121-2-3. Scientific packers to the Services and industry. Specialists in the packing of aircraft and aircraft components. Approved packers for the Admiralty, A.I.D., I.F.V., C.I.A., C.I.S., I.E.M.S., M.o.S. and many foreign Government Departments. [0920

PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the undermentioned applications to operate scheduled air services:—

Application No. 241 from Olley Air Service, Ltd., of Croydon Airport, Surrey, for a U.K. internal service with D.H. Dove, D.H.89 and Consul aircraft for the carriage of passengers, supplementary freight and mail between London (Croydon) and Birmingham (Castle Bromwich), at a frequency of one service on week-days and additional services on demand during the period of the British Industries Fair from May 3rd to May 14th, 1954, inclusive.

From Eagle Aviation, Ltd., of 29 Clarges Street, London, W.1:—

Application No. 242 for a seasonal inclusive tour service with Viking and Dakota aircraft for the carriage of passengers between London (Blackbushe) and Majorca (Palma) at a frequency of from one service fortnightly to one service weekly during the season from May to September, inclusive, for a period of seven years, commencing May 1st, 1954.

Application No. 243 for a seasonal inclusive tour service with Dakota aircraft for the carriage of passengers between London (Blackbushe) and Salzburg at a frequency of from one service fortnightly to one service weekly during the season from May to September, inclusive, for a period of seven years, commencing May 1st, 1954.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [1449

TUITION

AVIGATION, LTD.

(The Safe Guidance and Handling of Aircraft in the air)

30 CENTRAL CHAMBERS, EALING, W.5.

WE offer all courses appertaining to pilot/navigator licences.

DO contact us on any problem you have in mind and we will do our utmost to help. [0248

NIGHT flying. Auster and Gemini aircraft with radio, from £4 per hour.—Southend-on-Sea Flying School. Tel.: Rochford 56204. [0451

LEARN to fly for £24; instructors' licences and instrument flying for £3 per hour; night flying £4 per hour; residence 5 gns. weekly. Approved M.C.A. private pilot's licence course.—Wiltshire School of Flying, Ltd., Thruxton Aerodrome, Andover, Hants. [0253

AIRWORK LIMITED

LEADING STOCKISTS OF

DAKOTA SPARES
PRATT & WHITNEY SPARES
ALL ANCILLARY EQUIPMENT

Ex-Stock Deliveries

Rudder Assy.	5115212
Wing Tips	5115201
Flap Assy.	5115204
Stabilisers	5115208
Stabilisers	5115209
P & W Exhaust Valves	55226
P & W Exhaust Valves	30740
Rocker Assy.	15292
Rocker Assy.	15291
Magnetos	SF14LU7

Piston Rings Standard & Oversize

American Type Radio Spares
All Stocks A.R.B. Release

Send your enquiries to :—

AIRWORK LTD
Component Sales Dept.
SUTTON LANE, LANGLEY, BUCKS.
Telephone : Langley 520
Cables : Airwork, Slough

FREE! TO AMBITIOUS ENGINEERS 144-PAGE BOOK

Full details of the easiest and quickest way to prepare for A.F.R.Ae.S., A.R.B. Licences, B.Sc.(Eng.), A.M.I.Mech.E., City & Guilds, and hundreds of Home Study Courses in all branches of Aeronautical, Mechanical & Electrical Eng., Draughtsmanship, R.A.F. Maths., etc., are given in this valuable book. Our Courses have been approved by Royal Aeronautical Society and many B.I.E.T. Students have obtained First Places in the A.F.R.Ae.S. Exams.

We definitely Guarantee
NO PASS—NO FEE

A copy of this enlightening Guide to well-paid posts will be sent on request—FREE! Write : B.I.E.T., 388a, SHAKESPEARE HOUSE, 19, STRATFORD PLACE, LONDON, W.1.

BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

REFUELLING EQUIPMENT FOR SALE

500 gallon T.B. Self Mobile Refuellers.
900 gallon Brockhouse Trailers.
900 gallon Bedford Q.L. Tankers

Above fully reconditioned to "as new" standards, supplied with six months' guarantee.

Also Coles Cranes, lorry mounted and self mobile, crane repairs, spares and sales.

DERBY AVIATION LIMITED
Derby Airport, Burnaston, Derby

R.A.F. OFFICERS UNIFORMS

LARGE SELECTION IN STOCK
NEW AND RECONDITIONED
FISHERS, 86/88 WELLINGTON ST., WOOLWICH, S.E.18 'PHONE 1055

TUITION

NIGHT FLYING

INSTRUMENT RATING

TWIN CONVERSIONS

EVERY facility at reasonable rates from:—

SOUTHEND-ON-SEA MUNICIPAL AIR CENTRE AND FLYING SCHOOL, Municipal Airport, Southend-on-Sea. Rochford 56204. [0452

LONDON SCHOOL OF AIR NAVIGATION

OFFERS facilities for establishing oneself in a career. Keynote of success is our combined experience with personal approach.

ALL aspects of pilot/navigator qualifications. Our individual coaching methods lead to a very high degree of pass.

NEW "Home Study" courses excellent alternative. Full coverage; unique application; finest of kind; modern diagrammatic presentation.

LINK, briefing, procedures and R/T. instrument flying and refresher. Type ratings—general and specific.

ALL requirements rehabilitation from Services, advice without obligation.

33 Ovington Square, Knightsbridge, London, S.W.3. KEN. 8221. [0277

FREE! Brochure giving details of courses in all branches aero eng. covering A.F.R.Ae.S., A.R.B. Certs., M.C.A. exams, etc. We are the only postal training college operated by an industrial organisation. —Write to E.M.I. Institutes, Postal Division, Dept. F26, 43 Grove Park Road, London W.4. [0964

A.F.R.Ae.S., A.R.B.Certs., A.M.I.Mech.E., etc., on "no pass no fee" terms; over 95 per cent. successes. For details of exams and courses in all branches of aeronautical work, navigation, mechanical eng., write for 144-page handbook, free.—B.I.E.T. (Dept. 702), 29 Wright's Lane, London, W.8. [0707

BRITISH AIRCRAFT MAINTENANCE SCHOOL: Type courses on all light aircraft and engines for A, B, C and pilot's technical. Actual aircraft and practical facilities available on aerodrome site. Individual instruction and regular classes.—Full details from 325, Staines Road, Ashford, Middx. [1419

AERONAUTICAL. Comprehensive full-time technical and practical training for careers in all branches of aviation engineering. Diploma course leads to interesting executive appointments in civil aviation, design and development, draughtsmanship, maintenance, etc. Extended courses to prepare for A.F.R.Ae.S. and A.M.I.Mech.E. examinations.—Write for prospectus to Senior Master, College of Aeronautical Engineering, Chelsea, London, S.W.3. Flaxman 0021. [0019

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through the local office of the Ministry of Labour and National Service, etc., if the applicant is a man aged 18–64 or a woman aged 18–59 inclusive, unless he or she or the employer is excepted from the provisions of The Notification of Vacancies Order 1952.

GUIDED WEAPONS. The Bristol Aeroplane Co., Ltd., has a vacancy for

A QUALIFIED MECHANICAL ENGINEER SECTION LEADER

to take charge of a portion of a laboratory team engaged in the design and development of control systems.

APPLICANTS should have a comprehensive knowledge of servo theory and at least three years' experience in the design and development of electro-hydraulic control systems and light electrical mechanisms.

SALARIES, working conditions and prospects of promotion on merit are excellent.—Applications, giving details of experience and qualifications, should be addressed to the Personnel Manager, Bristol Aeroplane Co., Ltd., Aircraft Division, Filton House, Bristol. [1437

D. NAPIER AND SON, Ltd., Luton Airport, Beds, require:—

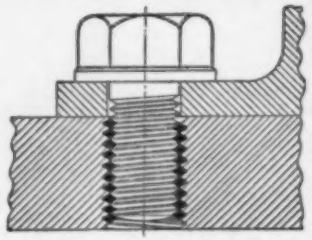
(1) Experienced senior electrical draughtsmen with knowledge of aircraft radio, electrical de-icing or electrical installation, for work on experimental engine flight development and various projects. Draughtsmen from other branches of the electrical industry considered.
(2) Senior aerodynamicist, experienced in sub-sonic and supersonic work.
(3) Technical author, sound engineering background essential, preferably with previous experience of handbooks, instruction manuals and technical press articles.
(4) Stressman for work on aircraft engine installations and advanced projects. At least three years stressing experience required, and standard of Higher National Certificate in Mechanical Engineering.

APPLICATIONS to the Personnel Manager at the above address. [1442

DESIGN draughtsmen required by R.F.D. Co., Ltd., Godalming. Must be experienced in mechanical engineering or rubberised fabric technology. Practical experience and technical qualifications essential. [1444

SKYWAYS, Ltd., require aircraft engineer with York/Merlin A. and C. licences for Mediterranean base. Generous allowances.—Write, Personnel Manager, 7 Berkeley Street, W.1. [0290

WIRE THREAD INSERTS



FOR NEW DESIGNS AND SALVAGE
CROSS MFG. CO. (1938) LTD.
COMBE DOWN, BATH
Tel.: COMBE DOWN 2355/6

MET-L-CHEK
(NON-TOXIC)

—A quick and inexpensive method of locating surface defects in all metals, costing one eighth of previous processes. Merely coat the suspect part with two preparations and any microscopic fissures become immediately apparent. Completely non-injurious to operators.

★ *Covers requirements of Civil Aircraft Inspection procedure B1/8-2. Full details on request*

C. J. FOX & SONS (AVIATION) LIMITED
117 VICTORIA ST., LONDON, S.W.1
Tel.: VICTORIA 0204/5736
Cables: EYEBOLTS, LONDON

The New 1954 'FLIGHT LIEUTENANT' HANDLESS WATCH

No Glass, No Dial, No Hands

Built for strength, fitted with aircraft shock-resisting movement. Lever escapement. Anti-magnetic and recoil click spring to prevent over-winding. Encased handsome chrome case. Expanding bracelet 10/6 extra if required. Time shown by revolving figures. Sent for 5/- dep. Bal. 10/- monthly. Night dial 6/6 extra. Mfrs. Full Guar. Cash price 79/6. Post etc., 1/3.

Free Illustrated Lists of other Watches, Binoculars, Tents, Suiting Patterns, Radios, Toys, etc. Terms, State Lists required.

HEADQUARTER & GENERAL SUPPLIES LTD.
(Dept. FLI 13), 196-200 Coldharbour Lane, Loughborough Junction, London, S.E.5.
Open all Saturday. 1 p.m. Wednesday

The . . .
British Air Line Pilots' Association
95 MOUNT STREET, W.1
Tel.: GROsvenor 6261

Membership open to all Commercial and Service pilots. For full details as to the objects and particulars of Membership please write to Secretary.

SITUATIONS VACANT

THE COLLEGE OF AERONAUTICS

VACANCY occurs for a demonstrator capable of supervising post-graduate students on jig and tool design, conducting investigations into production methods and demonstrating use of metrology equipment in the Department of Aircraft Economics and Production. Opportunity for promotion to lecturer on proved ability. Commencing salary within range £350 to £650, extending by annual increments to £750, with superannuation under F.S.S.U., and family allowance. Further particulars available.—Applications to the Record, The College of Aeronautics, Cranfield, Bletchley, Bucks. [1451

AN aircraft firm in the North-West have the following vacancies in their engineering research department.

(a) Two technicians are required to operate a high-altitude chamber and carry out tests on aircraft components.

(b) A number of technicians are required for work in connection with the testing of hydraulic systems, power-operated controls and airframe structures.

CANDIDATES for these vacancies should be of Higher National Certificate or degree standard, and preference will be given to those who have had experience in one of the above fields or on similar work in the aircraft industry.

THE work is of an interesting nature on advanced designs, salaries offered being attractive and commensurate with age and experience.

APPLICATIONS stating full details, including salary required, should be addressed to Box 2381. [1422

SENIOR and intermediate design draughtsmen with good experience of aircraft or light structural or mechanical engineering, required for aircraft and armament project work.—Apply, by letter, to Portsmouth Aviation, Ltd., The Airport, Portsmouth. [0612

WANTED, pilots for mapping and oblique photography, banner towing and passenger hopping, stationed in Frankfurt/M., Germany.—Aero Exploration, Mainzer Landstr. 313, Frankfurt/M., Germany. [1438

LICENSED radio engineer and radio mechanics at our base at Stansted Airport, Essex.—Apply by letter or telephone to the Senior Radio Engineer, Aviation Traders, Ltd., Southend Airport, Essex. Tel.: Rochford 56491. [0950

A. V. ROE AND CO., Ltd., have vacancies for aerodynamicists and senior aerodynamicists in their Chadderton design office. Candidates should have some previous experience of aerodynamics on either performance, stability and control, wind tunnel or flight test work.

THE Company are engaged in a progressive and expanding programme on the design and development of subsonic and supersonic projects, and the opportunities and prospects are outstanding.

PLEASE send particulars of age, experience and salary required to the Chief Designer, A. V. Roe and Co., Ltd., Greengate, Middleton, Manchester. [1421

AIRCRAFT or mechanical draughtsmen, all graded and junior aircraft stress and weightsmen required. —Apply, stating age, experience and salary required, to the Chief Draughtsman, Alan Muntz and Co., Ltd., Aircraft Division, Langley Aerodrome, Slough, Bucks. [0368

ARMSTRONG SIDDELEY MOTORS have vacancies for a technical writer and a technical artist in the Technical Publications Section of their Aero Sales Department. The work is interesting and applications are invited to Reference DL.1, Personnel Manager, Armstrong Siddeley Motors, Coventry. [1440

FIRST-CLASS chemist (electrical) required for development work, new projects, Surrey laboratory. Excellent prospects. Must be flexible, original, capable working closely with senior scientist. State age and salary required. Send application, with photograph, to Box 2394. Expenses paid for interview. [1426

DRAUGHTSMAN required for aircraft fuel gauge installation diagrams and details. Aircraft electrical installation experience preferred but not essential. Canteen. Pension scheme—Apply, Chief Development Engineer, Waymouth Gauges and Instruments Ltd., Station Road, Godalming, Surrey. [1430

H. M. HOBSON, Ltd., invite applications for positions in the drawing office as follows: designers, detail and modification draughtsmen, checkers, stressmen. The work is concerned with interesting projects connected with fuel metering equipment and hydraulic flying controls for aircraft.—Hobson Works, Fordhouses, Wolverhampton. [0420

SERVICE engineers required for installation, flight testing and servicing of aircraft navigational and auto-pilot equipment. Applicants must be prepared to travel. Essential to have sound knowledge of radio and electronic principles and practice, preferably to C. and G. Radio III standard. Good conditions, pension scheme.

APPLY with full details and salary required, quoting No. 1439, to Personnel Manager, Sperry Gyroscope Co., Ltd., Great West Road, Brentford, Middx. [1429

EXCEPTIONAL opportunities exist in the London area for a number of really ambitious electro-mechanical designers with drive and initiative. Those having proven record of experience in aircraft accessory design are preferred, but applications from adaptable designers of a.c. and d.c. fractional horse-power motors, inverters, electrical control gear and/or associated equipment will be welcomed. Three of these vacancies are for senior men, capable of controlling design groups. Substantial salaries are offered for all posts, commensurate with individual experience and qualifications (H.N.C. minimum).—Write in the first instance, in confidence, to Box 2498. [1443

SITUATIONS VACANT

REQUIRED immediately by Percival Aircraft, Ltd., Luton Airport, Beds, several draughtsmen with comprehensive experience of engine installation and allied systems. Good welfare facilities, including staff pension scheme.—Applications in writing, stating age, qualifications, experience and salary required to the Personnel Manager. [0601

TEST laboratory assistants (male) required by Percival Aircraft, Ltd., Luton Airport, Beds. National Certificate standard and previous experience on design of test laboratory equipment desirable. Good welfare facilities including staff pension scheme.—Applications, stating qualifications, experience, age and salary required to Personnel Manager. [0596

AIR FORCE, Naval, civil and helicopter aircraft all under design and development at Percival Aircraft, Ltd., Luton Airport, Beds. Applications are invited from senior and junior draughtsmen and stressmen for work on this interesting programme. Good welfare facilities, including staff pension scheme.—Write, giving details of experience and salary required, to Personnel Manager. [0595

AN attractive appointment in the London area is available for a senior engineer on the mechanical development of an interesting new aero-engine project. Applicants should preferably be between 30 and 40, with a good technical background (e.g., corporate membership of I.Mech.E. or R.Ae.S.), and must have considerable prior experience on the planning and execution of practical development programmes in a comparable field. This need not necessarily be aeronautical, e.g., a background on internal combustion engines of any type, steam turbines, pumps, or other high-class mechanical or hydraulic machinery, would be suitable. Excellent salary to the right man.—Apply to the Chief Engineer, the de Havilland Engine Co., Ltd., Stag Lane, Edgware, Middlesex. [1447

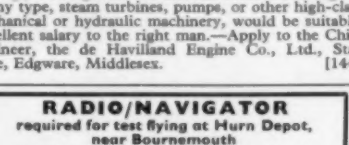
RADIO/NAVIGATOR

required for test flying at Hurn Depot, near Bournemouth

Experienced applicants only considered, holding Civil Radio Licence and a Civil Navigators Licence. Apply, giving full details of qualifications and experience, to the Employment Manager

VICKERS - ARMSTRONGS LIMITED
(Aircraft Division), Weybridge, Surrey

STANDARD AIRCRAFT PARTS



CURD COMPONENTS LTD.
41, LONSDALE ROAD, LONDON W.11.

PROPELLER TEST GEAR

Denisson Hydromatic Propeller Test Rigs complete with propeller boss. Electric motor operation new and unused. Also Hamilton balancing stands and Blade Straightening benches etc.

Staravia

BLACKBUSHE AIRPORT
CAMBERLEY, SURREY
Tel.: Camberley 1600

TECHNICAL INSTRUCTORS
(ELECTRICAL)

required for Aircraft Servicing School

Applicants must have had good technical training, sound practical experience on the maintenance of modern aircraft, and be capable of lecturing, drawing instructional diagrams, and writing students' lecture notes.

Applicants should be in a position to travel daily to Weybridge or make their own housing arrangements. Assistance can be given to secure individual lodging accommodation.

Apply to the EMPLOYMENT MANAGER

VICKERS - ARMSTRONGS LIMITED
(Aircraft Division), WEYBRIDGE, Surrey

SITUATIONS VACANT

SENIOR and intermediate draughtsmen with educational standard to Higher National Certificate, required for work on super priority aircraft contracts. The office location is in London and salaries of up to £750 p.a. are visualized. Assistance with accommodation will be given. Write stating age, and full particulars to:—Box AC85841, Samson Clarks, 57/61 Mortimer Street, W.1. [1417

JUNIOR and intermediate stressmen with educational standard to Higher National Certificate, required for work on super priority aircraft contracts. The office location is in London and salaries of up to £700 p.a. are visualized. Assistance with accommodation will be given.—Write stating age, and full particulars to: Box AC85843, Samson Clarks, 57/61 Mortimer Street, W.1. [1418

ARMSTRONG SIDDELEY MOTORS, Coventry, have vacancies for a number of designers and senior and junior draughtsmen. Although gas turbine experience is most advantageous it is not necessarily essential as training will be given in this specialized work to suitably qualified draughtsmen.—Apply in detail to Reference F.103, Personnel Manager, Armstrong Siddeley Motors, Coventry. [0200

FERRANTI, Ltd., Edinburgh, have a vacancy for a senior stress engineer for work in connection with the installation of experimental equipment in aircraft. Applicants should be fully qualified and must have experience in aircraft stress office work. Interesting work offering good prospects. Staff pension scheme.—Apply, giving full details of qualifications, training and experience, and quoting Ref. SE/DDO to the Personnel Officer, Ferranti, Ltd., Crewe Toll, Edinburgh 5. [1446

HANDLEY PAGE (READING), Ltd., The Aerodrome, Woodley, Reading, have an immediate vacancy for a senior aircraft electrical draughtsman for work on an interesting new project. Only those who are fully experienced in all aspects of the work should apply, and for the successful applicant there will be suitable housing accommodation provided.—Please send full particulars of experience, etc., to the Personnel Officer. [0235

THE ENGLISH ELECTRIC Co., Ltd., Luton, have vacancies for senior technicians and mechanical designers to work on rocket motor projects. These posts offer the opportunity of working on advanced designs and obtaining a key position in an expanding industry. Qualifications: an engineering degree or equivalent for technicians and H.N.C. for designers. Previous experience on rocket motors or aircraft power-plants is an advantage.—Applications to Dept. C.P.S., 336-7 Strand, W.C.2, quoting ref. 1024A. [1397

PRECISION engineering. The Instrument Design Group of The English Electric Co., Luton Division, is being expanded and the services are sought of a senior designer to head up the unit. The work involves design and development of high precision equipment, such as gyroscopes and similar precision equipment, to be used in conjunction with the guided weapons development programme. The position holds considerable responsibility and will be covered by an appropriate salary. Applications from qualified engineers for other positions in this group will also be welcomed.—Applications, quoting Reference 1142C, to Dept. C.P.S., 336-7 Strand, W.C.2. [1435

THE ENGLISH ELECTRIC Co., Ltd., of Luton, wish to appoint an engineer to lead a section responsible for expanding the application of solid fuel propellants to guided weapons. This work involves not only the design, development and proving of solid fuel motors, but also promotion of basic study and experiment on propellants and sponsoring analysis of solid fuel weapon performance. Previous experience of such activity, although highly desirable, is not essential. However, a degree in mechanical engineering, and some experience of combustion and thermodynamic problems, coupled with a freshness of approach to the use of new materials and methods, would be attractive qualifications.—Applications, quoting Ref. 1185A, to Dept. C.P.S., 336-7 Strand, W.C.2. [1436

PHYSICISTS, mathematicians and engineers required by Ministry of Supply, National Aeronautical Establishment, Bedford, where facilities for research include powerful new supersonic wind tunnels. Posts in this growing establishment offer excellent opportunities to those interested in working on aerodynamic problems of flight at supersonic speeds. Experience in this field not essential. Appointments, according to qualifications and experience, as: scientific officer (1st or 2nd class honours degree or equivalent in appropriate subject, £417 to £781; assistant experimental officer (at least Higher School Cert. (Science) or equivalent—degree or H.N.C. may be an advantage), £264 (age 18) to £576; experimental officer (at least H.S.C., etc., min. age 26), £649 to £799. Women somewhat less. Appointments unestablished. F.S.S.U. benefits may be available for S.O.s. Houses will be available for rental by married men.—Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting A209/53A. [1448

SITUATIONS WANTED

A.L.T.P., 3,500 hrs, seeks position; free at present Box 2481. [1439

FLIGHT radio officer (28), 4,000 hours, experienced all equipment, seeks position anywhere, preferably overseas.—Box 2493. [1441

AVIATION executive, experienced base, line, operations, administration; law degree, fluent French; willing serve overseas. Immediately available.—Box 2419. [1433

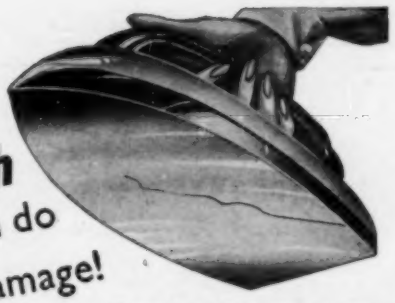
Series 231 In line Solenoid

One of our range of Solenoids from ¼" to 3" B.S.P. Other models up to 4,000 p.s.i 24v. D.C. Send for leaflets of our full range of reducing valves and pressure controllers, acid valve etc.

ON/OFF WORKING PRESSURE
1,500 p.s.i. GAS OR LIQUIDS
FULL BORE

A.I.D. APPROVED
CONTRACTORS TO M.o.S.

I.V. PRESSURE CONTROLLERS LTD
FORGE WORKS, 844, BATH ROAD
CRANFORD, MIDDLESEX Phone HAYES 2809-1203



Just a **scratch** ...but it can do **£££** of damage!

Protect precision-ground parts, expensive components, crankshafts, airscrews, turbine blades, injection equipment and projecting members of machines, by covering or lapping with Black Seal Waterproof Fabric Tape. Wherever high-value products are handled, transported, stored and assembled, the resilient strength of Black Seal provides dependable protection at comparatively low cost.

BLACK SEAL
Glossy WATERPROOF Fabric Tape
***prevents* damage**

Samples gladly from

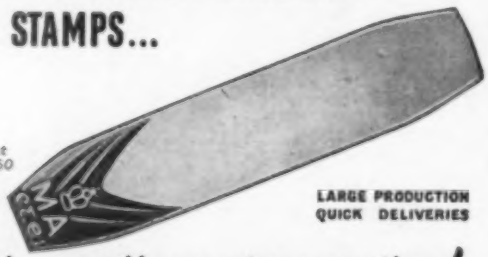
Gosheron

fulfils MOS (CS 2191) AID, CCI, IFV, PPCO, IEME, and Admiralty (K1359) requirements.

John Gosheron & Co Ltd Gayford Road London W12

MEERLOO SPECIALLY HARDENED STEEL STAMPS...

On A.I.D. Approved List No. 4362/50



LARGE PRODUCTION
QUICK DELIVERIES

...make a good impression every time!

JOHN MEERLOO & SONS LTD. 74, LONDON RD. KINGSTON-ON-THAMES

J. J. BENSON

Aircraft Furnishers · Approved Dunlopillo Stockists and Handbuilders

872-876 LONDON ROAD
LEIGH-ON-SEA · ESSEX
Telephone: Leigh-on-Sea 77423

INDEX TO ADVERTISERS

	Page
Acrotork Engineering Co., Ltd.	4
Adcola Products, Ltd.	16
Airwork, Ltd.	16, 19
Alvis, Ltd.	11
Benson, J. J.	20
Blackburn and General Aircraft, Ltd.	Cover i
Boulton Paul Aircraft, Ltd.	Cover iii
Bristol Aeroplane Co., Ltd., The	Cover iv
British Air Line Pilots' Association, The	18
British Emulsifiers, Ltd.	4
British Ermeto Corporation, Ltd.	2
British Institute of Engineering Technology	18
Cross Manufacturing Co. (1938), Ltd.	16, 18
Curd Components, Ltd.	19
De Havilland Aircraft Co., Ltd., The	10
Derby Aviation, Ltd.	18
Eagle Aircraft Services, Ltd.	17
Fairey Aviation Co., Ltd., The	9
Fishers	18
Folland Aircraft, Ltd.	13
Fox and Sons (Aviation), Ltd., C. J.	18
Gosheron and Co., Ltd., John	20
Headquarter and General Supplies, Ltd.	18
High Duty Alloys, Ltd.	12
Hordern-Richmond (Sales), Ltd.	2
I. V. Pressure Controllers, Ltd.	20
Lewis, Ltd., D.	16
Meerloo and Sons, Ltd., John	20
Napier and Son, Ltd., D.	6
Opperman, Ltd., S. E.	4
Rolls-Royce, Ltd.	7
Shell-Mex and B.P., Ltd.	8
Short Brothers and Harland, Ltd.	14
Sperry Gyroscope Co., Ltd.	Cover ii
Staravia	19
Suchy Holdings, Ltd.	15
Teddington Controls, Ltd.	5
Thermionic Products, Ltd.	5
Thompson Brothers (Bilston), Ltd.	3
Titanine, Ltd.	1
Vickers-Armstrongs Ltd.	19

Printed in Great Britain for the Publishers, ILIFFE & SONS LTD., Dorset House, Stamford Street, London, S.E.1, by SUN PRINTERS LTD., London, and Watford, Herts. *Flight* can be obtained abroad from the following: AUSTRALIA AND NEW ZEALAND: Gordon & Gotch, Ltd. INDIA: A. H. Wheeler & Co. CANADA: The Wm. Dawson Subscription Service, Ltd.; Gordon & Gotch, Ltd. SOUTH AFRICA: Central News Agency, Ltd.; Wm. Dawson & Sons (S.A.), Ltd. UNITED STATES: The International News Co. Entered as Second Class Matter at the New York, U.S.A., Post Office.

in production

and

in service

the

"The Aeroplane," copyright photograph

BALLIOL T. 2 advanced trainer

exhibits qualities that ensure a long and useful life at the lowest possible cost in money and manpower.

Designed for the utmost ease of servicing and repair, the Balliol is versatile in its uses and modest in its demands. Fuel consumption is low—no more than 40 gallons per hour at 200 knots at 10,000 feet—and utilization is high, due to the reduction in servicing times achieved by planned design. With a normal take-off run of 450 yards to clear a 50ft screen, the Balliol can operate with safety from small airfields in any part of the world.

BOULTON PAUL AIRCRAFT LTD

WOLVERHAMPTON, ENGLAND

Operation in mountainous country demands much of a helicopter, because take-off, hovering and landing at high-elevations are arduous conditions. During demonstrations before civil and military authorities in Switzerland, the Mk. 4 Sycamore performed lake and mountain rescue exercises, operated at maximum all-up weight from a mountain-side area at 5,400 ft. altitude, and went through a variety of rôle demonstrations involving ten landings, changes of loading and take-offs during which the rotors were not once stopped.

THE Bristol AEROPLANE COMPANY LIMITED · ENGLAND